ENVIRONMENTAL INVESTIGATION SERVICES

REPORT

TO

DESIGNINC SYDNEY PTY LTD

ON

ENVIRONMENTAL SITE ASSESSMENT AND REMEDIATION ACTION PLAN

FOR

NEW ULTIMO PYRMONT PUBLIC SCHOOL

AT

189 JONES STREET, ULTIMO

31 MAY 2018 **REF: E30361KHrpt3**

Postal Address: PO Box 976, North Ryde BC NSW 1670
Tel: 02 9888 5000 • Fax: 9888 5004
EIS is a division of Jeffery and Katauskas Pty Ltd • ABN 17 003 550 801

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Report prepared by:

Todd Hore
Associate | Environmental Engineer

Report reviewed by:

Brendan Page
Associate | Environmental Scientist
Certified Practitioner in Site Assessment and Management (CP SAM)
Site Contamination Practitioners Australia (SCPA)

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EXECUTIVE SUMMARY

Designinc Sydney Pty Ltd ('the client') commissioned Environmental Investigation Services (EIS) to undertake a Stage 2 Environmental Site Assessment (ESA) for the new Ultimo Pyrmont Public School at 189 Jones Street, Ultimo. EIS had previously undertaken a Preliminary ESA for the site that encountered contaminated fill material. The Stage 2 ESA was designed to better assess the contamination and provide an updated Remedial Action Plan (RAP) for the development.

In total 16 boreholes have been drilled across the site. The soil samples obtained encountered elevated concentrations of arsenic, lead and carcinogenic PAHs. The contamination was considered to be confined to the fill material and was unlikely to have impacted underlying natural soil/bedrock or groundwater. Remediation was considered to be required to render the site suitable for the proposed development.

The most appropriate remedial strategy was considered to be cap and containment of the impacted fill. The capping method included the following:

- Unpaved areas including landscaped or grassed areas with shallow plantings – visual marker layer comprising geogrid (e.g. TriAx) and geofabric (high visibility, orange, non-woven) over the contaminated fill, overlain by 0.2m to 0.5m of clean (validated) soil;
- Unpaved areas including landscaped or grassed areas with tree plantings – tree plantings should be boxed out to 1m deep over a 1m by 1m area. The base and sidewalls of the tree pits should be lined with visual marker layer comprising geogrid (e.g. TriAx) and geofabric over the contaminated fill. Areas where no trees are to be planted can include the marker layers and 0.2-0.5m of clean soil as noted above. The root ball of the tree should be approximately 0.5m above the marker layer;
- Paved areas – In areas where there is continuous paving (i.e. concrete) the pavement itself is considered to be a suitable capping layer; In areas where non-continuous paving is proposed (i.e. brick pavers) the capping should consist of visual marker layer comprising geogrid (e.g. TriAx) and geofabric over the contaminated fill, overlain by pavement materials; and
- Underground services – base and walls of service trenches are to be lined with a visual marker layer comprising geofabric over the contaminated fill. Service trenches are to be backfilled with clean (validated) materials. Overlying capping requirements to meet the specification for paved or unpaved areas as noted above.

Validation of the capping works will generally comprise site surveys to demonstrate the cap thickness and site inspections to confirm appropriate installation of the cap.

Contingency measures have been included in the event that large portions of the site are excavated down to natural soil/bedrock. In this case an excavation and off-site disposal remediation strategy may be implemented. This would typically comprise removal of all fill material followed by validation sampling and analyses.

EIS are of the opinion that the site can be made suitable for the proposed development provided this RAP is implemented accordingly. A site validation report and Environmental Management Plan (EMP) should be prepared on completion of remediation activities.

The conclusions and recommendations should be read in conjunction with the limitations presented in the body of the report.

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ABBREVIATIONS

Asbestos Fines/Fibrous Asbestos	**AF/FA**
Ambient Background Concentrations	**ABC**
Added Contaminant Limits	**ACL**
Asbestos Containing Material	**ACM**
Australian Drinking Water Guidelines	**ADWG**
Area of Environmental Concern	**AEC**
Australian Height Datum	**AHD**
Acid Sulfate Soil	**ASS**
Above-Ground Storage Tank	**AST**
Below Ground Level	**BGL**
Benzo(a)pyrene Toxicity Equivalent Factor	**BaP TEQ**
Bureau of Meteorology	**BOM**
Benzene, Toluene, Ethylbenzene, Xylene	**BTEX**
Cation Exchange Capacity	**CEC**
Contaminated Land Management	**CLM**
Contaminant(s) of Potential Concern	**CoPC**
Chain of Custody	**COC**
Conceptual Site Model	**CSM**
Development Application	**DA**
Data Quality Indicator	**DQI**
Data Quality Objective	**DQO**
Detailed Site Investigation	**DSI**
Ecological Investigation Level	**EIL**
Environmental Investigation Services	**EIS**
Ecological Screening Level	**ESL**
Environmental Management Plan	**EMP**
Excavated Natural Material	**ENM**
Environment Protection Authority	**EPA**
Environmental Site Assessment	**ESA**
Ecological Screening Level	**ESL**
Fibre Cement Fragment(s)	**FCF**
General Approval of Immobilisation	**GAI**
Health Investigation Level	**HILs**
Hardness Modified Trigger Values	**HMTV**
Health Screening Level	**HSLs**
International Organisation of Standardisation	**ISO**
Lab Control Spike	**LCS**
Light Non-Aqueous Phase Liquid	**LNAPL**
Map Grid of Australia	**MGA**
National Association of Testing Authorities	**NATA**
National Environmental Protection Measure	**NEPM**
Organochlorine Pesticides	**OCP**
Organophosphate Pesticides	**OPP**
Polycyclic Aromatic Hydrocarbons	**PAH**
Potential ASS	**PASS**
Polychlorinated Biphenyls	**PCBs**

ABBREVIATIONS

Photo-ionisation Detector	**PID**
Protection of the Environment Operations	**POEO**
Practical Quantitation Limit	**PQL**
Quality Assurance	**QA**
Quality Control	**QC**
Remediation Action Plan	**RAP**
Relative Percentage Difference	**RPD**
Site Assessment Criteria	**SAC**
Sampling, Analysis and Quality Plan	**SAQP**
Site Audit Statement	**SAS**
Site Audit Report	**SAR**
Site Specific Assessment	**SSA**
Source, Pathway, Receptor	**SPR**
Specific Contamination Concentration	**SCC**
Standard Penetration Test	**SPT**
Standard Sampling Procedure	**SSP**
Standing Water Level	**SWL**
Trip Blank	**TB**
Toxicity Characteristic Leaching Procedure	**TCLP**
Total Recoverable Hydrocarbons	**TRH**
Trip Spike	**TS**
Upper Confidence Limit	**UCL**
United States Environmental Protection Agency	**USEPA**
Underground Storage Tank	**UST**
Virgin Excavated Natural Material	**VENM**
Volatile Organic Compounds	**VOC**
World Health Organisation	**WHO**
Work Health and Safety	**WHS**

Units

Litres	**L**
Metres BGL	**mBGL**
Metres	**m**
Millivolts	**mV**
Millilitres	**ml or mL**
Milliequivalents	**meq**
micro Siemens per Centimetre	**µS/cm**
Micrograms per Litre	**µg/L**
Milligrams per Kilogram	**mg/kg**
Milligrams per Litre	**mg/L**
Parts Per Million	**ppm**
Percentage	**%**

1 INTRODUCTION

Designinc Sydney Pty Ltd ('the client') commissioned Environmental Investigation Services (EIS)[1] to undertake a Stage 2 Environmental Site Assessment (ESA) for the new Ultimo Pyrmont Public School at 189 Jones Street, Ultimo ('the site'). The development will occur at the former Ultimo Public School site. The site location is shown on Figure 1 and the assessment was confined to the site boundaries as shown on Figure 2.

A geotechnical investigation was undertaken in conjunction with this assessment by JK Geotechnics[2]. The results of the investigation are presented in a separate report (Ref: 30361SBrpt2[3]). This report should be read in conjunction with the JK report.

EIS have previously undertaken a Preliminary Environmental Site Assessment (ESA)[4] for the site and prepared a preliminary remediation action plan (RAP)[5]. A summary of this information has been included in Section 2.

1.1 Proposed Development Details

From the supplied architectural drawings by the client (Project No: S15124, Drawing Nos: DA-2301 to DA-2306, DA-3001, DA-3002, DA-4001 and DA-4002, Revision 1, dated 16 December 2016) the existing school will be completely demolished and a new school constructed. The new school will extend to all site boundaries. The new development will step up the hillside and will be formed at three main floor levels of RL4.5m at the western end, RL11.7m within the central portion and RL15.3m at the eastern end. However, a lower parking area is proposed within the north-western corner at RL2.9m. To achieve these levels excavation will be required to maximum depths of approximately 6m at the eastern edge of each step in level. At the western end of each level the proposed level will be up to approximately 2m higher than the existing surface. At this point it is unknown if fill will be placed in areas where the finished level is above the existing level or a void left below the lowest floor slabs.

1.2 Aims and Objectives

The primary aims of the assessment were to better assess the site contamination conditions, and make a preliminary assessment of the groundwater contamination conditions. The assessment objectives were to:

- Assess the current site conditions and use(s) via a site walkover inspection;

[1] Environmental consulting division of Jeffery & Katauskas Pty Ltd (J&K)

[2] Geotechnical consulting division of J&K

[3] Referred to as JK Geotechnics (2018)

[4] Report to DesignInc Sydney Pty Ltd on Preliminary Environmental Site Assessment for New Ultimo Pyrmont Public School at 189 Jones Street, Ultimo (ref: E30361KHrpt-rev2, dated 24 October 2017)

[5] Report to DesignInc Sydney Pty Ltd on Preliminary Remediation Action Plan for New Ultimo Pyrmont Public School at 189 Jones Street, Ultimo (ref: E30361KHrpt2-RAP, dated 15 January 2018)

- Identify and update potential contamination sources/areas of environmental concern (AEC) and contaminants of potential concern (CoPC);
- Assess the soil and groundwater contamination conditions via implementation of a sampling and analysis program;
- Prepare an updated conceptual site model (CSM);
- Assess the potential risks posed by contamination to the receptors identified in the CSM (Tier 1 assessment);
- Provide a preliminary waste classification for off-site disposal of soil;
- Assess whether the site is suitable or can be made suitable for the proposed development (from a contamination viewpoint);
- Assess whether further intrusive investigation and/or remediation is required;
- Assess the potential for Acid Sulfate Soils (ASS) in the lower section of the site; and
- Prepare an updated RAP for the site to outline measures to be implemented to render the site suitable for the proposed development.

1.3 Scope of Work

The assessment was undertaken generally in accordance with an EIS proposal (Ref: EP46068KH) of 2 November 2017 and written acceptance from the client of 13 December 2017. The scope of work included the following:

- Review of site information, including background and site history information contained in the Preliminary ESA report;
- Preparation of an updated CSM;
- Design and implementation of a sampling, analysis and quality plan (SAQP);
- Interpretation of the analytical results against the adopted Site Assessment Criteria (SAC);
- Data Quality Assessment; and
- Preparation of a report including a Tier 1 risk assessment and a RAP.

The scope of work was undertaken with reference to the National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended (2013)[6], other guidelines made under or with regards to the Contaminated Land Management Act (1997)[7] and State Environmental Planning Policy No.55 – Remediation of Land (1998)[8]. A list of reference documents/guidelines is included in the appendices.

[6] National Environment Protection Council (NEPC), (2013). *National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013).* (referred to as NEPM 2013)

[7] Contaminated Land Management Act 1997 (NSW) (referred to as CLM Act 1997)

[8] *State Environmental Planning Policy No. 55 – Remediation of Land 1998* (NSW) (referred to as SEPP55)

2 SITE INFORMATION

2.1 Background

2.1.1 Preliminary Environmental Site Assessment

The Preliminary ESA included a review of a previous investigation report, walkover site inspection and soil sampling from 8 boreholes across the site.

A Preliminary Contamination Investigation was undertaken by the Specialist Services Section (NSW Public Works, NSW Water Solutions). The results are contained in the report dated November 2015 (ref: 15-GS94B). The investigation included a review of historical site information and soil sampling from 6 boreholes. Heavy Metals, Total Recoverable Hydrocarbons (TRH) and Polycyclic Aromatic Hydrocarbons (PAHs) were encountered in the fill material during previous investigations. The lead results in the fill in B6 (south-west section of the site) and the Benzo(a)Pyrene TEQ (Carcinogenic PAHs) results in the fill in B1 and B2 (North-east section of the site) were above the HIL-A criteria. The lead result in B6 was 330mg/kg and was only slightly above the HIL-A criterion of 300mg/kg.

The historical information contained in the preliminary investigation report indicated that the site has been owned by the Minister for Education and Training since 1989. Between 1921 and 1989, the land was Crown Land. From 1914 to 1921, the Railway Commissioner for NSW owned the land. Between 1867 and 1914, the land was privately owned. The historical information indicated that the development of the present school features, including the majority of the building construction and slope formation occurred in the 1960s. Placement of the imported topsoil in the upper terrace (eastern playing field) area probably occurred around the mid-1980s. Construction for the administration block was underway in 2002, and the building and current carpark at the western end of the school (lower terrace) were completed prior to 2004. The softfall surface on the upper terrace was placed at some time after 2005.

The main source of potential contaminant at the site was considered to be the fill material. Fill material was encountered beneath the pavement in all EIS boreholes and extended to depths of approximately 1.5m to 8.1m. The fill was typically shallower (approximately 2m) in the west section of the site.

The lead results in the BH6 (1.5-1.95m) and BH6 (3-3.45m) samples were 310mg/kg and 400mg/kg, respectively, and exceeded the HIL-A criterion. The B(a)P TEQ (Carcinogenic PAHs) result of 13mg/kg in the BH6 (0.5-0.95m) sample exceeded the HIL-A criterion. The remaining PAHs results were below the HIL-A criteria.

The source of the PAHs and lead including lead in the fill samples was considered to be associated with the ash and slag inclusions encountered in the fill matrix. The natural soil samples analysed below the fill profile were not impacted by the contaminants. The TRH F3 encountered in the fill in BH6 was considered likely to be associated with elevated PAHs rather than a fuel or other hydrocarbon source. Laboratory summary tables from the Preliminary ESA are attached in the appendices.

EIS considered that the site could be made suitable for the proposed development provided that the following recommendations were implemented to address the data gaps and to better characterise the risks:

1. Undertake a Stage 2 ESA**;**
2. Prepare a RAP to outline remedial measures for the site;
3. In the event active remediation is preferred at the site, prepare a Validation Assessment (VA) report on completion of remediation;
4. In the event management is preferred over active remediation, prepare an Environmental Management Plan (EMP) for the ongoing management of contamination remaining on site. The EMP will require establishment of appropriate public notification under Section 10.7 of the EP&AA 1979 or a covenant registered on the title to land under Section 88B of the Conveyancing Act 1919; and
5. Undertake demolition of the building in accordance with the Hazardous Materials Assessment (Hazmat) previously prepared for the existing buildings.

2.1.2 Preliminary RAP

A Preliminary RAP was prepared by EIS based on the information contained in the Preliminary ESA. The RAP recommended a data gap investigation that included soil sampling from an additional 8 locations. As part of the soil sampling, groundwater sampling was recommended from 2 monitoring wells.

The remediation extent for the purpose of the RAP included fill material across the entire site. This was a conservative estimate, made due to the data gaps associated with insufficient sampling undertaken to the point in time when the preliminary RAP was prepared.

The remediation methods selected for the site included a combination of excavation and off-site disposal, together with cap and containment. Where fill material was to be excavated, validation was required to confirm successful removal of impacted fill.

Where capping was required, the recommend capping specification included the following:

- Unpaved areas including landscaped or grassed areas with shallow plantings – visual marker layer comprising geogrid (e.g. TriAx) and geofabric (high visibility, orange, non-woven) over the contaminated fill, overlain by 0.2m to 0.5m of clean (validated) soil;
- Unpaved areas including landscaped or grassed areas with tree plantings – tree plantings should be boxed out to 1m deep over a 1m by 1m area. The base and sidewalls of the tree pits should be lined with visual marker layer comprising geogrid (e.g. TriAx) and geofabric over the contaminated fill. Areas where no trees are to be planted can include the marker layers and 0.2-0.5m of clean soil as noted above. The root ball of the tree should be approximately 0.5m above the marker layer; and
- Paved areas – In areas where there is continuous paving (i.e. concrete) the pavement itself is considered to be a suitable capping layer; In areas where non-continuous paving is proposed (i.e. brick pavers) the capping should consist of visual marker layer comprising geogrid (e.g. TriAx) and geofabric over the contaminated fill, overlain by pavement materials

EIS were of the opinion that the site could be made suitable for the proposed development subject to implementation of the recommended remediation strategy, completion of site validation and implementation of an EMP.

2.2 Site Identification

Table 2-1: Site Identification

Current Site Owner:	Minister for Education and Training
Site Address:	189 Jones Street, Ultimo
Lot & Deposited Plan:	Lot 101 DP 1105527
Current Land Use:	Primary School
Proposed Land Use:	Primary School
Local Government Authority:	City of Sydney
Current Zoning:	B4 Mixed Use
Site Area (m^2):	5,350
RL (AHD in m) (approx.):	10
Geographical Location (decimal degrees) (approx.):	Latitude: -33.8777 Longitude: 151.1956
Site Location Plan:	Figure 1
Sample Location Plan:	Figure 2
Site Contamination Data:	Figure 3

2.3 Site Location and Regional Setting

The site is located in a predominantly residential area of Ultimo and is bound by Jones, Quarry and Wattle Streets to the east, north and west, respectively. The site is located approximately 500m to the south-east of Blackwattle Bay.

2.4 Topography

The regional topography generally falls to the west at 5-10° with a north-south orientated ridgeline located to the east of the site. The site itself falls to the west at approximately 5-10° overall, however, several terraces have been cut into the slope to create level areas.

2.5 Site Inspection

A walkover inspection of the site was undertaken by EIS on 9 May 2018. The inspection was limited to accessible areas of the site and immediate surrounds. A summary of the inspection findings are outlined in the following subsections:

2.5.1 Current Site Use and/or Indicators of Former Site Use

At the time of the inspection, the site was a working construction site. The former buildings had been demolished and pavement removal was in progress.

2.5.2 Buildings, Structures and Roads

All of the former school buildings had been demolished. The west section of the site was paved with concrete. Demolition rubble including concrete, bricks and steel reinforcement were stockpiled in the central section of the site.

2.5.3 Boundary Conditions, Soil Stability and Erosion

Soil was exposed at the surface in the east section of the site. The former garden and softfall surfaces had been removed. Cinder block retaining walls were observed in the central-north section of the site and retained the site in three tiers.

A fill ramp had been constructed through the central section of the site to allow machinery movement between the former tiers.

The site was fully fenced along all boundaries and included retaining walls along the east and south boundaries. The retaining wall along the east boundary remained approximately 1.6m high and retained Jones Street above the site. The retaining wall along the south boundary was of variable height and generally followed the former/existing tiers at the site.

2.5.4 Visible or Olfactory Indicators of Contamination

No visual or olfactory indicators of contamination were observed at the site.

2.5.5 Presence of Drums/Chemicals, Waste and Fill Material

Deep fill material is known to be present in the east and central sections of the site.

2.5.6 Drainage and Services

Stormwater infrastructure at the site has been or was being removed as part of demolition works. As removal of pavements progresses across the site infiltration is more likely.

2.5.7 Sensitive Environments

Sensitive environments such as wetlands, ponds, creeks or extensive areas of natural vegetation were not identified on site or in the immediate surrounds.

2.5.8 Landscaped Areas and Visible Signs of Plant Stress

Some mature trees remained in the south-east section of the site. No obvious signs of dieback were observed.

2.6 Surrounding Land Use

During the site inspection, EIS observed the following land uses in the immediate surrounds:

- North – A large commercial, warehouse building was located to the north of Quarry Street. Signage indicated the building was occupied by Johnson & Johnson (health care and pharmaceutical products);
- South – high rise residential apartments;
- East – mixed retail and residential area including apartment buildings and street front shops (framing, take-away sushi and computers sales/repairs); and
- West – Parkland and Wentworth Park Greyhound track.

EIS did not observe any land uses in the immediate surrounds that were identified as potential contamination sources for the site.

2.7 Underground Services

The 'Dial Before You Dig' (DBYD) plans were reviewed for the assessment in order to establish whether any major underground services exist at the site or in the immediate vicinity that could act as a preferential pathway for contamination migration. Major services were not identified that would be expected to act as preferential pathways for contamination migration.

3 GEOLOGY AND HYDROGEOLOGY

3.1 Regional Geology

A review of the regional geological map of Sydney (1983[9]) indicates that the site is underlain by Hawkesbury Sandstone, which typically consists of medium to coarse grained quartz sandstone with minor shale and laminite lenses. An area underlain by man-made fill is located immediately west of the site. This fill typically consists of dredged estuarine sand and mud, demolition rubble, industrial and household waste.

3.2 Acid Sulfate Soil Risk and Planning

The site is not located in an acid sulfate soil (ASS) risk area according to the risk maps prepared by the Department of Land and Water Conservation. An area of disturbed terrain is located immediately west of the site.

3.3 Hydrogeology

A review of groundwater bore records available on the NSW Office of Water[10] (NOW) online database was undertaken on 24 May 2017 for the Preliminary ESA. The search was limited to registered bores located within a radius of approximately 500m of the site. No registered bores were located within the search area.

The information reviewed for this assessment indicated that the subsurface conditions at the site are likely to consist of residual soils overlying relatively shallow bedrock. The potential for viable groundwater abstraction and use of groundwater under these conditions is considered to be low.

3.4 Receiving Water Bodies

Surface water bodies were not identified in the immediate vicinity of the site. The closest surface water body is Blackwattle Bay located approximately 500m to the north-west of the site. This water body could be a potential receptor, however, due to the distance from the site, the potential for Blackwattle Bay to be a receptor is low.

[9] Department of Mineral Resources, (1983). *1:100,000 Geological Map of Sydney (Series 9130).*

[10] http://www.waterinfo.nsw.gov.au/gw/

4 CONCEPTUAL SITE MODEL

NEPM (2013) defines a CSM as a representation of site related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The CSM for the site is presented in the following sub-sections and is based on the site information (including the site inspection information) and the review of site history information. Reference should also be made to the figures attached in the appendices.

A review of the CSM in relation to source, pathway and receptor (SPR) linkages has been undertaken as part of the Tier 1 risk assessment process, as outlined in Section 10.

4.1 Potential Contamination Sources/AEC and CoPC

The potential contamination sources/AEC and CoPC are presented in the following table:

Table 4-1: Potential (and/or known) Contamination Sources/AEC and Contaminants of Potential Concern

Source / AEC	CoPC
Fill material – The site appears to have been historically filled to achieve the existing levels. The fill may have been imported from various sources and could be contaminated. Historical information indicated that the majority of the site was filled in the 1960's. The Preliminary ESA encountered elevated concentrations of carcinogenic PAHs and lead in the fill at BH6.	Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), petroleum hydrocarbons (referred to as total recoverable hydrocarbons – TRHs), benzene, toluene, ethylbenzene and xylene (BTEX), polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCPs), organophosphate pesticides (OPPs), polychlorinated biphenyls (PCBs) and asbestos.
Use of pesticides – Pesticides may have been used beneath the buildings and/or around the site. Pesticides were not encountered during the Preliminary ESA and, therefore, potential pesticide contamination was considered to be a low risk.	Heavy metals and OCPs
Hazardous Building Material – Hazardous building materials may be present as a result of former building and demolition activities.	Asbestos, lead and PCBs

4.2 Mechanism for Contamination, Affected Media, Receptors and Exposure Pathways

The mechanisms for contamination, affected media, receptors and exposure pathways relevant to the potential contamination sources/AEC are outlined in the following CSM table:

Table 4-2: CSM

Potential mechanism for contamination	The potential mechanisms for contamination are most likely to include 'top-down' impacts and spills. There is a potential for sub-surface releases to have occurred if deep fill (or other buried industrial infrastructure) is present, although this is considered to be the least likely mechanism for contamination.
Affected media	Soil/soil vapour and groundwater have been identified as potentially affected media.
Receptor identification	Human receptors include site occupants/users (adults and children), construction workers and intrusive maintenance workers. Off-site human receptors include adjacent land users and recreational water users within Blackwattle Bay. Ecological receptors include terrestrial organisms and plants within unpaved areas (including the proposed landscaped areas), and marine ecology in Blackwattle Bay.
Potential exposure pathways	Potential exposure pathways relevant to the human receptors include ingestion, dermal absorption and inhalation of dust (all contaminants) and vapours (volatile TRH, naphthalene and BTEX). The potential for exposure would typically be associated with the construction and excavation works, and future use of the site. Potential exposure pathways for ecological receptors include primary contact and ingestion. Exposure during future site use could occur via direct contact with soil in unpaved areas such as gardens, inhalation of airborne asbestos fibres during soil disturbance, or inhalation of vapours within enclosed spaces such as buildings and basements.
Potential exposure mechanisms	The following have been identified as potential exposure mechanisms for site contamination: • Vapour intrusion into the proposed basement and/or building (either from soil contamination or volatilisation of contaminants from groundwater); • Contact (dermal, ingestion or inhalation) with exposed soils in landscaped areas and/or unpaved areas; and • Migration of groundwater off-site and into nearby water bodies, including aquatic ecosystems and those being used for recreation.
Presence of preferential pathways for contaminant movement	Contaminant migration at the site would potentially be restricted by the various retaining walls and terraces. No preferential pathways have been identified.

5 SAMPLING, ANALYSIS AND QUALITY PLAN

5.1 Data Quality Objectives (DQO)

Data Quality Objectives (DQOs) were developed to define the type and quality of data required to achieve the project objectives outlined in Section 1.2. The DQOs were prepared with reference to the process outlined in Schedule B2 of NEPM (2013) and the Guidelines for the NSW Site Auditor Scheme, 3rd Edition (2017)[11]. The seven-step DQO approach for this project is outlined in the following sub-sections.

The DQO process is validated in part by the Data Quality Assurance/Quality Control (QA/QC) Evaluation. The Data (QA/QC) Evaluation is summarised in Section 7.1 and the detailed evaluation is provided in the appendices.

5.1.1 Step 1 - State the Problem

The CSM identified actual and potential sources of contamination/AEC at the site that may pose a risk to human health and the environment. Additional investigation data is required to assess the contamination status of the site, and assess the risks posed by the contaminants in the context of the proposed development/intended land use, in order to develop the RAP. Lead and carcinogenic PAHs contamination were encountered previously in the north-east section of the site. Further investigation was required to meet the minimum recommended sampling density.

A waste classification is required prior to off-site disposal of excavated soil/bedrock.

The additional boreholes drilled at the site were designed to be as evenly spaced as possible between the previous sampling locations, whilst targeting the previously inaccessible areas (e.g. beneath former buildings).

5.1.2 Step 2 - Identify the Decisions of the Study

The objectives of the assessment are outlined in Section 1.2. The decisions to be made reflect these objectives and are as follows:

- Did the site inspection, or does the historical information identify potential contamination sources/AEC at the site?
- Are any results above the SAC?
- Do potential risks associated with contamination exist, and if so, what are they?
- Is remediation required?
- Is the site characterisation sufficient to provide adequate confidence in the above decisions?
- Is the site suitable for the proposed development, or can the site be made suitable subject to further characterisation and/or remediation?

[11] NSW EPA (2017). *Guidelines for the NSW Site Auditor Scheme, 3rd ed.* (referred to as Site Auditor Guidelines 2017)

5.1.3 Step 3 - Identify Information Inputs

The primary information inputs required to address the decisions outlined in Step 2 include the following:

- Existing relevant environmental data from previous reports;
- Site information, including site observations;
- Sampling of potentially affected media, including soil and groundwater;
- Observations of sub-surface variables such as soil type, photo-ionisation detector (PID) concentrations, odours and staining, and groundwater physiochemical parameters;
- Laboratory analysis of soils and groundwater for the CoPC identified in the CSM; and
- Field and laboratory QA/QC data.

5.1.4 Step 4 - Define the Study Boundary

The sampling will be confined to the site boundaries as shown in Figure 2 (spatial boundary). The soil sampling was completed between 3 May and 8 May 2018 (temporal boundary). The assessment of potential risk to adjacent land users has been made based on data collected within the site boundary.

5.1.5 Step 5 - Develop an Analytical Approach (or Decision Rule)

5.1.5.1 Tier 1 Screening Criteria

The laboratory data will be assessed against relevant Tier 1 screening criteria (referred to as SAC), as outlined in Section 6. Exceedances of the SAC do not necessarily indicate a requirement for remediation or a risk to human health and/or the environment. Exceedances are considered in the context of the CSM and valid SPR-linkages.

For this assessment, the individual results have been assessed as either above or below the SAC. Statistical evaluation of the dataset via calculation of mean values and/or 95% upper confidence limit (UCL) values has not been undertaken due to individual concentration of carcinogenic PAHs encountered previously in BH6 being more than 250% of the SAC.

5.1.5.2 Field and Laboratory QA/QC

Field QA/QC included analysis of inter-laboratory duplicates, intra-laboratory duplicates and trip blank samples. Further details regarding the sampling and analysis undertaken, and the acceptable limits adopted, is provided in the Data Quality (QA/QC) Evaluation in the appendices.

The suitability of the laboratory data is assessed against the laboratory QA/QC criteria which is outlined in the attached laboratory reports. These criteria were developed and implemented in accordance with the laboratory's National Association of Testing Authorities, Australia (NATA) accreditation and align with the acceptable limits for QA/QC samples as outlined in NEPM (2013) and other relevant guidelines.

In the event that acceptable limits are not met by the laboratory analysis, other lines of evidence are reviewed (e.g. field observations of samples, preservation, handling etc) and, where required, consultation with the laboratory is undertaken in an effort to establish the cause of the non-conformance. Where uncertainty exists, EIS typically adopt the most conservative concentration reported (or in some cases, consider the data from the affected sample as an estimate).

5.1.5.3 Appropriateness of Practical Quantitation Limits (PQLs)

The PQLs of the analytical methods are considered in relation to the SAC to confirm that the PQLs are less than the SAC. In cases where the PQLs are greater than the SAC, a discussion of this is provided.

5.1.6 Step 6 – Specify Limits on Decision Errors

To limit the potential for decision errors, a range of quality assurance processes are adopted. A quantitative assessment of the potential for false positives and false negatives in the analytical results is undertaken with reference to Schedule B(3) of NEPM (2013) using the data quality assurance information collected.

Decision errors can be controlled through the use of hypothesis testing. The test can be used to show either that the baseline condition is false or that there is insufficient evidence to indicate that the baseline condition is false. The null hypothesis is an assumption that is assumed to be true in the absence of contrary evidence. For this assessment, the null hypothesis has been adopted which is that, there is considered to be a complete SPR linkage for the CoPC identified in the CSM unless this linkage can be proven not to (or unlikely to) exist. The null hypothesis has been adopted for this assessment.

5.1.7 Step 7 - Optimise the Design for Obtaining Data

The most resource-effective design will be used in an optimum manner to achieve the assessment objectives. Adjustment of the assessment design can occur following consultation or feedback from project stakeholders. For this investigation, the design was optimised via consideration of the various lines of evidence used to select the sample locations, the media being sampled, and also by the way in which the data were collected.

The sampling plan and methodology are outlined in the following sub-sections.

5.2 Soil Sampling Plan and Methodology

The soil sampling plan and methodology adopted for this assessment is outlined in the table below:

Table 5-1: Soil Sampling Plan and Methodology

Aspect	Input
Sampling Density	Samples were collected from a total of 16 locations (8 for the Preliminary ESA and 8 for this assessment) as shown on the attached Figure 2. Based on the site area (5,350m^2). This number of locations met the minimum sampling density for hotspot identification, as outlined in the NSW EPA Contaminated Sites Sampling Design Guidelines (1995)[12]. EIS note that sampling locations were designed to be evenly spread across the site, however, the locations were not placed on an even grid. Therefore, theoretical hotspot diameters have not been calculated.
Sampling Plan	The sampling locations were generally placed on a systematic plan to provide site coverage and to assess previously inaccessible areas.
Set-out and Sampling Equipment	Sampling locations were set out using a tape measure. In-situ sampling locations were cleared for underground services by an external contractor prior to sampling as outlined in the standard sampling procedure (SSP). Samples were collected using a drill rig equipped with spiral flight augers. Soil samples were obtained from a Standard Penetration Test (SPT) split-spoon sampler, or directly from the auger when conditions did not allow use of the SPT sampler.
Sample Collection and Field QA/QC	Soil samples were obtained from 3 to 8 May 2018 in accordance with the SSP attached in the appendices. Soil samples were collected from the fill and natural profiles based on field observations. The sample depths are shown on the logs attached in the appendices. Samples were placed in glass jars with plastic caps and teflon seals with minimal headspace. Samples for asbestos analysis were placed in zip-lock plastic bags. During sampling, soil at selected depths was split into primary and duplicate samples for field QA/QC analysis.
Field Screening	A portable Photoionisation Detector (PID) fitted with a 10.6mV lamp was used to screen the samples for the presence of volatile organic compounds (VOCs). PID screening for VOCs was undertaken on soil samples using the soil sample headspace method. VOC data was obtained from partly filled zip-lock plastic bags following equilibration of the headspace gases. PID calibration records are maintained on file by EIS. Fill/spoil at the sampling locations was visually inspected during the works for the presence of fibre cement fragments.
Decontami-nation and Sample Preservation	Sampling personnel used disposable nitrile gloves during sampling activities. Soil samples were preserved by immediate storage in an insulated sample container with ice in accordance with the SSP. On completion of the fieldwork, the samples were stored temporarily in fridges in the EIS warehouse before being delivered in the insulated sample container to a NATA registered laboratory for analysis under standard chain of custody (COC) procedures.

[12] NSW EPA, (1995), *Contaminated Sites Sampling Design Guidelines.* (referred to as EPA Sampling Design Guidelines 1995)

Aspect	Input

5.3 Groundwater Sampling Plan and Methodology

The groundwater sampling plan and methodology is outlined in the table below:

Table 5-2: Groundwater Sampling Plan and Methodology

Aspect	Input
Sampling Plan	Groundwater monitoring wells were installed in BH104 (MW104) and BH106 (MW106). The wells were positioned to gain a snap-shot of the groundwater conditions. Considering the topography and the location of the nearest down-gradient water body, MW104 was considered to be in the intermediate to up-gradient area of the site, however would be expected to provide an indication of groundwater conditions immediately down-gradient of BH6 (where lead and carcinogenic PAHs were encountered in soil). MW106 was considered to be in down-gradient area of the site and would be expected to provide an indication of groundwater flowing across (beneath) the site and beyond the down-gradient site boundary.
Monitoring Well Installation Procedure	The monitoring well construction details are documented on the appropriate borehole logs attached in the appendices. The monitoring wells were installed to depths of approximately 6.3m to 6.4m below ground level. The wells were generally constructed as follows: • 50mm diameter Class 18 PVC (machine slotted screen) was installed in the lower section of the well to intersect groundwater; • 50mm diameter Class 18 PVC casing was installed in the upper section of the well (screw fixed); • A 2mm sand filter pack was used around the screen section for groundwater infiltration; • A hydrated bentonite seal/plug was used on top of the sand pack to seal the well; and • A gatic cover was installed at the surface with a concrete plug to limit the inflow of surface water.
Monitoring Well Development	The monitoring wells were developed on 9 May 2018 using a submersible electrical pump in accordance with the SSP. Due to the hydrogeological conditions, groundwater inflow into the wells was relatively low, therefore, the wells were pumped until they were effectively dry. MW104 was pumped dry after approximately 1L was removed. The field monitoring records are attached in the appendices.
Groundwater Sampling	The monitoring wells were allowed to recharge for approximately seven days after development. Upon return to site on 16 May 2018, EIS discovered that MW106 had been damaged during pavement removal works and was no longer a viable monitoring well. Groundwater samples were attempted to be obtained from MW104, however, insufficient sample could be obtained. No groundwater sampling was completed for this assessment.

Aspect	Input

5.4 Analytical Schedule

The analytical schedule is outlined in the following table:

Table 5-3: Analytical Schedule

Analyte/CoPC	Fill Samples	Natural Soil Samples
Heavy Metals	22	2
TRH/BTEX	22	2
PAHs	22	2
Asbestos	22	2
ASS (sPOCAS)	5	1
pH/CEC/Clay Content (%)	2	-
Toxicity characteristic leachate procedure (TCLP) Metals and/or PAHs for waste classification purposes	11	-

5.4.1 Laboratory Analysis

Samples were analysed by an appropriate, NATA Accredited laboratory using the analytical methods detailed in Schedule B(3) of NEPM 2013. Reference should be made to the laboratory reports attached in the appendices for further details.

Table 5-4: Laboratory Details

Samples	Laboratory	Report Reference
All primary samples and field QA/QC samples including (intra-laboratory duplicates, trip blanks, trip spikes and field rinsate samples)	Envirolab Services Pty Ltd NSW, NATA Accreditation Number – 2901 (ISO/IEC 17025 compliance)	191242 and 191242-A
Inter-laboratory duplicates	Envirolab Services Pty Ltd VIC, NATA Accreditation Number – 2901 (ISO/IEC 17025 compliance)	13773

6 SITE ASSESSMENT CRITERIA (SAC)

The SAC were derived from the NEPM 2013 and other guidelines as discussed in the following sub-sections. The guideline values for individual contaminants are presented in the attached report tables and further explanation of the various criteria adopted is provided in the appendices.

Soil data were compared to relevant Tier 1 screening criteria in accordance with NEPM (2013) as outlined below.

6.1 Human Health

- Health Investigation Levels (HILs) for a 'residential with accessible soils' (suitable for primary schools) exposure scenario (HIL-A);
- Health Screening Levels (HSLs) for a 'low-high density residential' exposure scenario (HSL-A & HSL-B). HSLs were calculated based on the soil type and the most conservative depth interval of 0m to 1m;
- Where exceedances of the HSLs were reported for hydrocarbons (TRH/BTEX and naphthalene), the soil health screening levels for direct contact presented in the CRC Care Technical Report No. 10 – Heath screening levels for hydrocarbons in soil and groundwater Part 1: Technical development document (2011)[13] were considered; and
- Asbestos was assessed on the basis of presence/absence. Asbestos HSLs were not adopted as detailed asbestos quantification was not undertaken.

6.2 Environment (Ecological – terrestrial ecosystems)

- Ecological Investigation Levels (EILs) and Ecological Screening Levels (ESLs) for an 'urban residential and public open space' (URPOS) exposure scenario. The criteria for benzo(a)pyrene has been increased from the value presented in NEPM (2013) based on the information presented in the CRC Care Technical Report No. 39 – Risk-based management and guidance for benzo(a)pyrene (2017)[14];
- ESLs were calculated based on the soil type. EILs for selected metals were calculated using average site specific soil parameters for pH, cation exchange capacity and clay content. The average parameters were based on analysis of one coarse material (gravelly sand) and one fine material (sandy clay/clayey sand) sample. The data was applied to all samples of similar material. These data were used to select the added contaminant limit (ACL) values presented in Schedule B(1) of NEPM (2013), and published ambient background concentration (ABC) presented in the

[13] Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC Care), (2011). Technical Report No. 10 - *Health screening levels for hydrocarbons in soil and groundwater Part 1: Technical development document*

[14] CRC Care, (2011). *Technical Report No. 39 - Risk-based management and guidance for benzo(a)pyrene*

document titled Trace Element Concentrations in Soils from Rural and Urban Areas of Australia (1995)[15]. This method is considered to be adequate for the Tier 1 screening.

6.3 Management Limits for Petroleum Hydrocarbons

Management limits for petroleum hydrocarbons (as presented in Schedule B1 of NEPM 2013) were considered (if required) following evaluation of human health and ecological risks, and risks to groundwater.

6.4 Waste Classification

Data for the waste classification assessment were assessed in accordance with the Waste Classification Guidelines, Part 1: Classifying Waste (2014)[16] as outlined in the following table:

Table 6-1: Waste Categories

Category	Description
General Solid Waste (non-putrescible)	• If Specific Contaminant Concentration (SCC) ≤ Contaminant Threshold (CT1) then Toxicity Characteristics Leaching Procedure (TCLP) not needed to classify the soil as general solid waste; and • If TCLP ≤ TCLP1 and SCC ≤ SCC1 then treat as general solid waste.
Restricted Solid Waste (non-putrescible)	• If SCC ≤ CT2 then TCLP not needed to classify the soil as restricted solid waste; and • If TCLP ≤ TCLP2 and SCC ≤ SCC2 then treat as restricted solid waste.
Hazardous Waste	• If SCC > CT2 then TCLP not needed to classify the soil as hazardous waste; and • If TCLP > TCLP2 and/or SCC > SCC2 then treat as hazardous waste.
Virgin Excavated Natural Material (VENM)	Natural material (such as clay, gravel, sand, soil or rock fines) that meet the following: • That has been excavated or quarried from areas that are not contaminated with manufactured chemicals, or with process residues, as a result of industrial, commercial mining or agricultural activities; • That does not contain sulfidic ores or other waste; and • Includes excavated natural material that meets such criteria for virgin excavated natural material as may be approved from time to time by a notice published in the NSW Government Gazette.

[15] Olszowy, H., Torr, P., and Imray, P., (1995), *Trace Element Concentrations in Soils from Rural and Urban Areas of Australia. Contaminated Sites Monograph Series No. 4*. Department of Human Services and Health, Environment Protection Agency, and South Australian Health Commission.

[16] NSW EPA, (2014). *Waste Classification Guidelines, Part 1: Classifying Waste.* (referred to as Waste Classification Guidelines 2014)

6.5 Acid Sulfate Soil

Soil data for the ASS assessment were compared to the action criteria for presented in the Acid Sulfate Soil Manual (1998)[17] as summarised below. The action criteria for 'coarse textured soils' were adopted.

Table 6-2: ASS Action Criteria

Category	Description	Criteria
Coarse Textured Soils	Sands to loamy sands	• pH - less than 5; • Total Actual Acidity (TAA)/Total Sulfide Acidity (TSA)/ Total Potential Acidity (TPA) (pH5.5) – greater than 18mol H^+/tonne; and • S_{pos} – greater than 0.03% sulfur oxidisable.
Medium Textured Soils	Sandy loams to light clays	• pH - less than 5; • TAA/TSA/TPA (pH5.5) – greater than 36mol H^+/tonne; and • S_{pos} – greater than 0.06% sulfur oxidisable.
Fine Textured Soils	Medium to heavy clays and silty clays	• pH - less than 5; • TAA/TSA/TPA (pH5.5) – greater than 62mol H^+/tonne; and • S_{pos} – greater than 0.1% sulfur oxidisable.

It is noted that where disturbance of greater than 1,000 tonnes of ASS is proposed, the action criteria for 'coarse textured soils' apply to all soil types.

[17] Acid Sulfate Soils Management Advisory Committee (ASSMAC), (1998). *Acid Sulfate Soils Manual* (referred to as ASS Manual 1998)

7 RESULTS

7.1 Summary of Data (QA/QC) Evaluation

The data evaluation is presented in the appendices. In summary, EIS are of the opinion that the data are adequately precise, accurate, representative, comparable and complete to serve as a basis for interpretation to achieve the investigation objectives.

7.2 Subsurface Conditions

A summary of the subsurface conditions encountered during the investigation is presented in the table below. Reference should be made to the borehole logs attached in the appendices for further details.

Table 7-1: Summary of Subsurface Conditions

Profile	Description
Pavement	Concrete pavement, approximately 290mm to 320mm thick, was encountered at the surface in BH106 to BH108.
Fill	Fill was encountered at the surface or beneath the pavement in all boreholes and extended to depths of approximately 2.65m to 10.5m. The fill typically comprised silty sand/gravelly sand, silty clay and/or clayey sand/sandy clay with inclusions of sandstone gravel, brick and concrete fragments, ash, slag and igneous gravel.
Natural Soil	A shallow band of silty sand and/or sandy silty clay was encountered beneath the fill in BH107 and BH108 at depths of approximately 2.7-3m and 4-4.2m, respectively. This dark grey, shallow band was identified as estuarine soil. Residual sandy clay/clayey sand was encountered beneath the estuarine soil in BH108 and extended to a depth of approximately 6.5m.
Bedrock	Sandstone bedrock was encountered beneath the fill or natural soil in all boreholes and extended to the termination of the boreholes at a maximum depth of approximately 15.3m.
Groundwater	Groundwater seepage was not encountered in the boreholes during drilling. All boreholes remained dry on completion of drilling and a short time after. Groundwater monitoring wells were installed in BH104 and BH106. The standing water level (SWL) was measured on 9 May 2018 at depths of approximately 6.1m and 3.9m, respectively.

7.3 Field Screening

PID soil sample headspace readings are presented in attached report tables and the COC documents attached in the appendices. All results were less than 1ppm isobutylene equivalents which indicates a lack of PID detectable VOCs.

Groundwater seepage was encountered in the bottom of MW104. The SWL was measured at 3.9m below the ground surface in MW106 prior to destruction of the well. Groundwater across the majority of the site is expected to be associated with perched water on the surface of the bedrock. Groundwater may be present in the lower (west) section of the site (where MW106 was installed). Groundwater would be expected to flow to the north-west.

7.4 Soil Laboratory Results

The soil laboratory results are compared to the relevant SAC in the attached report tables. A summary of the results assessed against the SAC is presented below:

7.4.1 Human Health and Environmental (Ecological) Assessment

Table 7-2: Summary of Soil Laboratory Results – Human Health and Environmental (Ecological)

Analyte	Results Compared to SAC
Heavy Metals	The lead results in the BH101 (1.5-1.95m), BH102 (3-3.45m) and BH103 (1.5-1.95m) samples exceeded the human health based SAC. The arsenic result in the BH103 (0-0.2m) exceeded the human health based SAC. The copper result in the BH102 (3-3.45m) sample and the arsenic result in the BH103 (0-0.2m) sample exceeded the ecological based SAC. The remaining heavy metals results were below the SAC.
TRH	All TRH results were below the SAC.
BTEX	All BTEX results were below the SAC.
PAHs	The carcinogenic PAHs results in the BH101 (0.5-0.95m), BH101 (1.5-1.95m), BH105 (0.5-0.95m), BH106 (0.5-0.95m), BH107 (0.5-0.95m) and BH108 (0.5-0.95m) samples exceeded the human health based SAC. The remaining PAH results were below the SAC.
Asbestos	All asbestos results were below the SAC (i.e. asbestos was absent in the samples analysed for the investigation).

7.4.2 Waste Classification Assessment

The laboratory results were assessed against the criteria presented in Part 1 of the Waste Classification Guidelines, as summarised previously in this report. The results are presented in the report tables attached in the appendices. A summary of the results is presented below.

Table 7-3: Summary of Soil Laboratory Results Compared to CT and SCC Criteria

Analyte	No. of Samples Analysed	No. of Results > CT Criteria	No. of Results > SCC Criteria	Comments
Heavy Metals	24	12	0	Lead concentrations exceeded the CT1 criterion in 11 fill samples. The maximum lead concentration was 340mg/kg. The arsenic concentration of 220mg/kg in the BH103 (0-0.2m) fill sample exceeded the CT1 criterion.
TRH	24	0	0	-
BTEX	24	0	0	-
Total PAHs	24	0	0	-
Benzo(a)pyrene	24	8	0	Benzo(a)pyrene concentrations exceeded the CT1 criterion in 8 fill samples. The maximum benzo(a)pyrene concentration was 5.9mg/kg.
Asbestos	24	-	-	Asbestos was not detected in the samples analysed.

Table 7-4: Summary of Soil Laboratory Results Compared to TCLP Criteria

Analyte	No. of Samples Analysed	No. of Results > TCLP Criteria	Comments
Arsenic	1	0	The fill sample with an arsenic concentration above the CT1 criterion were analysed for TCLP arsenic.
Lead	11	0	The 11 fill samples with lead concentrations above the CT1 criterion were analysed for TCLP lead.
Benzo(a)pyrene	8	0	The 8 fill samples with benzo(a)pyrene concentrations above the CT1 criterion were analysed for TCLP PAHs, including benzo(a)pyrene.

7.4.3 Acid Sulfate Soil Assessment

The soil laboratory results were assessed against the action criteria adopted for the assessment. The results are presented in the attached report tables and summarised below.

Table 7-5: Summary of ASS Results

Analyte	Results Compared to ASS Guidelines
pH_{kcl} and pH_{ox}	The pH_{KCl} results ranged from 6.0 to 8.9. None of the pH_{KCl} results exceeded (i.e. were below) the action criterion of pH 5. Following oxidation, the pH_{ox} results for the samples ranged from 2.8 to 7.7. The pH_{KCl} results exceeded (i.e. were below) the action criterion of pH 5 in the BH105 (5.5-5.7m) and BH108 (4-4.5m) samples. The pH of the samples typically dropped by 1 or more units following oxidation.
Acid Trail	• TAA results were all less than the PQL and less than the action criterion of 18mol H^+/tonne; • TPA results ranged from less than the PQL to 85mol H^+/tonne. The BH105 (5.5-5.7m) and BH108 (4-4.5m) sample results were above the action criterion of 18mol H^+/tonne; and • TSA results ranged from less than PQL to 84mol H^+/tonne. The BH105 (5.5-5.7m) and BH108 (4-4.5m) sample results were above the action criterion of 18mol H^+/tonne.
Sulfur Trail	The S_{pos}% results ranged from less than the PQL to 0.08%. The S_{pos}% result in the BH105 (5.5-5.7m) sample exceeded the action criterion of 0.03%. The majority of the results were below the action criterion. Chromium reducible sulphur (S_{Cr}) testing was undertaken on the BH105 (5.5-5.7m) sample. The result was greater than the action criterion of 0.03%.
Liming Rate	The liming rate required for neutralisation was 3.9kg$CaCO_3$/tonne.

8 WASTE CLASSIFICATION ASSESSMENT

8.1 Waste Classification of Fill

Due to the presence of potential ASS in the deep fill in BH105, further investigation in the vicinity of BH105 will be required to classify this material for off-site disposal.

Based on the results of the assessment, and at the time of reporting, the remaining fill material at the site is classified as **General Solid Waste (non-putrescible)**. Surplus fill should be disposed of to a facility that is appropriately licensed to receive this waste stream. The facility should be contacted to obtain the required approvals prior to commencement of excavation.

The above classification includes the sandy clay encountered during the Preliminary ESA in BH3 logged as 'possibly fill'.

8.2 Preliminary Classification of Natural Soil and Bedrock

The below classification excludes the natural estuarine soil encountered in BH107 and BH108. This soil is considered likely to be impacted with sulphidic ores.

Based on the scope of work undertaken for this assessment/screening, and at the time of reporting, EIS are of the opinion that the natural residual soil and bedrock at the site is likely to meet the definition of **VENM** for off-site disposal or re-use purposes. Inspections will be required prior to any bulk excavation of natural material to confirm the effective removal of overlying contaminated fill material. VENM is considered suitable for re-use on-site, or alternatively, the information included in this report may be used to assess whether the material is suitable for beneficial reuse at another site as fill material. In accordance with Part 1 of the Waste Classification Guidelines, the VENM is pre-classified as general solid waste and can also be disposed of accordingly to a facility that is licensed to accept it.

9 ACID SULFATE SOIL ASSESSMENT

The S_{pos}% result in the BH105 (5.5-5.7m) sample exceeded the action criterion of 0.03%. A Chromium reducible sulphur (S_{Cr}) test was undertaken on the sample. The result was also above the action criteria. EIS note that bulk excavation is not proposed in the vicinity of BH105.

EIS note that estuarine soils were encountered in BH107 and BH108 at depths of 2.7m and 4m, respectively. Although these soils were not analysed for ASS, EIS consider it likely that they are ASS or PASS. Excavation is understood to be proposed to a maximum depth of approximately 1.5m in this area ad these soils are unlikely to be disturbed. If, however, excavation is proposed that will disturb these estuarine soils or bulk excavation is undertaken in the vicinity of BH105, an ASS Management Plan (ASSMP) will be required for the development.

10 DISCUSSION AND CONCLUSIONS

10.1 Tier 1 Risk Assessment and Review of CSM

For a contaminant to represent a risk to a receptor, the following three conditions must be present:

1. Source – The presence of a contaminant;
2. Pathway – A mechanism or action by which a receptor can become exposed to the contaminant; and
3. Receptor – The human or ecological entity which may be adversely impacted following exposure to contamination.

If one of the above components is missing, the potential for adverse risks is relatively low.

10.1.1 Soil

Carcinogenic PAHs and lead were encountered in the fill material across the site at concentrations above the human health based SAC. Arsenic was also encountered above the human health based SAC in the fill in BH103. The contamination poses a risk to site users via inhalation and ingestion of impacted fill material.

The contamination was considered likely to be associated with ash and slag material within the fill. The contamination appeared to be confined vertically to the depth of fill material across the site, which ranges from 1.5m in the south-west section to 8.1m in the north-east section of the site. The arsenic impacted material was limited to a depth of 0.5m and underlying samples were not impacted. The natural soil samples analysed below the fill profile were not impacted by the contaminants.

The contaminants were not leaching or were leaching at very low concentrations. The proposed development will include pavement across the majority of the site, which will further limit the potential for infiltration and subsequent leaching of contaminants. Therefore, the contamination is considered unlikely to have impacted natural soils, bedrock and groundwater.

Trace concentrations of heavy fraction TRH were encountered in some fill samples. The TRH is considered likely to be associated with elevated PAHs rather than a fuel or other hydrocarbon source.

Due to the heterogeneous nature of the fill material, the contamination is considered likely to exist in pockets of fill material across the entire site. Therefore, the horizontal extent of the contamination is considered to include the entire site.

Arsenic and copper were encountered in the fill material in BH103 and BH102, respectively, at concentrations above the ecological based SAC. Both of these locations are in an area likely to be occupied by a school building and/or pavements, which would result in an incomplete source-pathway-receptor (S-P-R) linkage. In the event gardens or landscaped areas are proposed in the south-central section of the site, further consideration of these exceedences may be warranted.

10.1.2 Groundwater

Two monitoring wells were installed at the site, however, no groundwater sampling was completed. This was due to a lack of groundwater in MW104 and damage to MW106 that rendered the well unusable. As stated above the risk to groundwater posed by the contaminants encountered in the soil at the site is considered to be low.

Based on this, the lack of groundwater sampling is not considered to have impacted the reliability of the Tier 1 risk assessment and the risks posed by groundwater to the receptors under the proposed development scenario are considered to be low and acceptable.

10.2 Decision Statements

The decision statements are addressed below:

Did the site inspection, or does the historical information identify potential contamination sources/AEC at the site?

Yes, fill was identified as the major potential contamination source.

Are any results above the SAC?

Yes, arsenic, lead and carcinogenic PAHs were encountered in the fill material above the human health based SAC across the site.

Arsenic and copper were encountered in the fill in one section of the site at concentrations above the ecological based SAC.

Do potential risks associated with contamination exist, and if so, what are they?

Yes. The contamination above the human health based SAC presents a risk to human receptors, in particular following removal of pavement at the site. These risks can easily be mitigated via the construction of overlying hard surfaces and/or clean capping layers that results in an incomplete SPR-linkage.

The contamination encountered above the ecological SAC in one section of the site is considered unlikely to present a risk to the receptors as this section of the site is expected to be paved during development. The risk would may warrant further consideration in the event gardens or landscaped areas are proposed in this section of the site.

Is remediation required?

Yes, remediation will be required to reduce the risk of exposure to future site users posed by the contamination above the human health based SAC.

Is the site characterisation sufficient to provide adequate confidence in the above decisions?

Yes, EIS consider that the site has been adequately characterised.

Is the site suitable for the proposed development, or can the site be made suitable subject to further characterisation and/or remediation?

EIS consider that the site can be made suitable for the proposed development subject to remediation and successful validation.

10.3 Data Gaps

The assessment has identified the following data gaps:

- No groundwater analyses were undertaken due to conditions encountered and well damage. This data gap is considered unlikely to impact the adequate characterisation of the site, as sufficient soil/fill data was obtained to draw conclusions on the likelihood of potential impacts to groundwater; and
- Due to the variability of natural bedrock and soil profiles, the depth of fill cannot be accurately mapped across the site. This has been considered in the development of the RAP.

11 ESA RECOMMENDATIONS AND CONCLUSIONS

EIS consider that the report objectives outlined in Section 1.2 have been addressed.

EIS consider that the assessments completed to date have enabled the site to be adequately characterised. Based on the results of these assessments, EIS consider that the site can be made suitable for the proposed development subject to the implementation of the RAP presented in the following sections of this report.

Prior to commencement of excavation and remediation, consideration should be given to whether an ASSMP is required. If excavation (including piling) will disturb soils identified as ASS, then an ASSMP should be prepared for these works.

12 REMEDIATION ACTION PLAN

12.1 Remediation Goal, Aims and Objectives

The goal of the remediation is to render the site suitable and confirm the suitability of the site for the proposed development.

The primary aim of the remediation is to cap the contamination beneath a suitable barrier to eliminate the exposure pathway to the contaminants of concern and reduce the risks to an acceptable level.

The objectives of the RAP are to:

- Provide a methodology to remediate and validate the site;
- Provide a framework for staged remediation and validation of the various site areas;
- Provide a contingency plan for the remediation works;
- Outline site management procedures to be implemented during remediation work; and
- Provide an unexpected finds protocol to be implemented during the development works.

12.2 Site Contamination Characterisation

The fill across the entire site is considered to be impacted by lead and carcinogenic PAHs. Arsenic was also encountered at one location. The contamination is considered to be confined to the fill material and is unlikely to have impacted underlying materials or groundwater. The contamination presents a risk to site users (adults and children) through potential inhalation, dermal contact and ingestion of soil. Removal of either the contaminated material or the pathway would result in this risk being negligible.

Heavy metals and TRH F3 were encountered in the fill material above the ecological based SAC during this assessment and the previous Preliminary ESA. As buildings and pavement are proposed across these areas of site these exceedances are not considered to impact the suitability of the site for the proposed development and, therefore, are not considered to require remediation.

12.3 Remediation Options

12.3.1 Soil Remediation

The NSW EPA follows the hierarchy set out in NEPM 2013 for the remediation of contaminated sites. The preferred order for soil remediation and management is as follows:

1. On-site treatment of soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level;
2. Off-site treatment of excavated material so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level, after which the soil is returned to the site;

Or if the above are not practicable:

3. Consolidation and isolation of the soil by on-site by containment within a properly designed barrier; and
4. Removal of contaminated material to an approved site or facility, followed where necessary by replacement with clean material; or
5. Where the assessment indicates that remediation would have no net environmental benefit or would have a net adverse environmental effect, implementation of an appropriate management strategy.

The Site Auditor Guidelines 2017 provide the following additional requirements to be taken into consideration:

- Remediation should not proceed in the event that it is likely to cause a greater adverse effect than leaving the site undisturbed; and
- Where there are large quantities of soil with low levels of contamination, alternative strategies should be considered or developed.

12.3.2 Site Specific Remediation Options

The tables below summarise the site specific remediation options:

Table 12-1: Site Specific Remediation Options

Option	Discussion	Applicability
Option 1 On-site treatment of contaminated soil	On-site treatment provides a mechanism to reuse the processed material and in some instances, to avoid the need for large scale earthworks. Some of the treatment options include: Bio-remediation: Addition of oxygen and nutrient compounds to accelerate the natural process of organic compound decay within the environment. Soils require excavation and stockpiling prior to treatment. Not suitable for all contaminants. Soil Washing: Soil is stripped of contaminants via a leaching process and the concentrated contaminated liquid product retained for disposal or additional treatment. Air Sparging and Extraction: Air is forced through the contaminated soil to volatilise organic contaminants. The air is then extracted and captured for treatment leaving reduced contaminant concentrations within the sub-strata. Thermal Desorption: Contaminated soils are heated within an incinerator to volatilise or combust the contaminants. Contaminants are either broken down to water and carbon dioxide or alternatively trapped within an air filtration system. Licenses are necessary for specific individual waste streams due to the potential for air pollution and the formation of harmful by-products during the incineration process.	Generally not applicable for this project. On-site treatment options are generally very expensive and time consuming. These are applicable for large scale remediation work of sites with large areas impacted by contaminants that can be treated. The contaminants of concern at this site include heavy metals, carcinogenic PAHs and TRH. Most of these compounds are very difficult to treat as they don't breakdown easily. Considering the costs and the nature of the contaminants present, this option is not considerable to be viable.

Option	Discussion	Applicability
Option 2 Off-site treatment of contaminated soil	Contaminated soils are excavated, transported to an approved/ licensed treatment facility, treated to remove/stabilise the contaminants then returned to the subject site, transported to an alternative site or disposed to an approved landfill facility. This option provides for a relatively short program of on-site works, however there may be some delays if the material is to be returned to the site following treatment. The cost per tonne for transport to and from the site and for treatment is considered to be relatively high. The material would also have to be assessed in terms of suitability for reuse as part of the proposed development works.	Not applicable for this project.
Option 3 Consolidation and isolation of impacted soil by cap and containment	This would include the placement of an impermeable barrier such as concrete, or a warning barrier and non-contaminated soil material, over the existing ground surface to isolate the contaminated material and thereby reduce the health risk to future site users. This action may also reduce the transport of contamination via surface water movement, dust generation and potentially groundwater infiltration, however, environmental issues would need to be evaluated. Such an option should only be considered where other preferred approaches from the NSW EPA hierarchy are not applicable. The capping and/or containment must be appropriate for the specific contaminants of concern. An ongoing environmental management plan (EMP) would be required and site identification documentation, possibly including the S.10.7 council planning certificate and/or the land title, would be modified to note the presence of the	This option is considered to be the most viable option for the fill material remaining on-site on completion of earthworks. The majority of the site will be paved with concrete which will limit the exposure to receptors.

Option	Discussion	Applicability
	contamination. This may impact upon development approval conditions and limit the future potential land value.	
Option 4 Removal of contaminated material to an appropriate facility and reinstatement with clean material	Contaminated soils would be classified in accordance with NSW EPA guidelines for waste disposal, excavated and disposed of off-site to a NSW EPA licensed landfill. The material would have to meet the requirements for landfill disposal. Landfill gate fees (which may be significant) would apply in addition to transport costs.	May be a viable option for areas of this project that includes extensive excavation to or into natural material.

12.4 Remediation Details

Prior to commencement of remediation work, the site management plan for remediation works (see Section 12.7) should be reviewed and implemented by the remediation contractor.

Prior to the commencement of remediation, geotechnical advice should be sought with regards to the stability of the proposed excavation and adjacent structures/features. Geotechnical advice should also be sought regarding the requirements of any backfill material used for the reinstatement (temporary or otherwise) of the remediation areas.

12.4.1 Sequence of Remediation Works

Remediation is likely to be staged with the proposed excavation and development works. Provided that suitable precautions are taken to minimise the potential for cross-contamination (e.g. prevention of impacted fill being placed on areas already capped), EIS are of the opinion that the sequence of the remediation works should have no significant impact on the outcome of the validation.

As the finished surface will form the cap for the site, the client should engage with the consent authority as early as possible so that the requirement to provide the site validation is appropriately conditioned in the consent (i.e. validation can be completed prior to the occupancy certificate but not for the construction certificate).

12.4.2 Remediation of the Site

12.4.2.1 Rationale for Selection of Remedial Strategy

EIS understand that excavation of all the fill material at the site is unlikely to occur and that fill material will remain at the site. The most viable option for remediation of the site is considered to be cap and containment (Option 3). For simplicity this approach should be adopted across the entire site. This will minimise potential issues associated with appropriate mapping of caped or uncapped areas and cross contamination.

The site is to be terraced as part of the proposed development, with the eastern side of each terrace requiring excavation. In the event significant portions of the site (e.g. at least one full terrace) are excavated into natural soil/bedrock and the client or remediation contractor does not wish to cap the area, there may be scope to use the excavation and off-site disposal to an appropriate facility (Option 4) strategy as a contingency measure and validate that the terrace area has been remediated and validated so that capping and future management are not required. The strategy details have been included to cover this contingency measure.

12.4.2.2 Remediation Details – Cap and Contain

The specific remediation details are described below:

Table 12-2: Remediation Details – Cap and Contain

Step	Procedure
1.	Address Stability Issues and Underground Services: Geotechnical advice should be sought regarding the stability of the adjacent structures and/or adjacent areas prior to commencing the excavation and/or filling (as required).
2.	Personal Protective Equipment and Work Health and Safety: The minimum PPE required for the remediation includes the following: • Disposable gloves; • Eye protection; and • Hard hat, covered clothing and steel toed boots.
3.	Site Preparation: Any remaining pavement in the remediation areas should be cut and removed with care using an excavator or similar.
4.	Excavation of fill material from the surface In areas where the existing ground surface is at or above the proposed levels, excavation of surficial fill material will be required. Excavation of fill material should be undertaken at least to the required depth to allow for minimum acceptable capping standards. Excavation of the areas will be undertaken as follows: • Submit an application to dispose of the fill soil (in accordance with the assigned waste classification) to an appropriately licensed landfill, and obtain authorisation to dispose; and • Load the fill soil onto trucks and dispose in accordance with the assigned waste classification. If backfilling of the excavation is required to create a level platform prior to capping, the backfill should be VENM which should be compacted to the requirements of the proposed development. All documents including landfill dockets, liquid waste disposal etc. should be retained and forwarded to the client for inclusion into the validation report to be prepared by the validation consultant.
5.	Capping Procedures: The following are considered to be the minimum acceptable capping standards for the purpose of remediation: • Unpaved areas including landscaped or grassed areas with shallow plantings – visual marker layer comprising geogrid (e.g. TriAx) and geofabric (high visibility, orange, non-woven) over the contaminated fill, overlain by 0.2m to 0.5m of clean (validated) soil; • Unpaved areas including landscaped or grassed areas with tree plantings – tree plantings should be boxed out to 1m deep over a 1m by 1m area. The base and sidewalls of the tree pits should be lined with visual marker layer comprising geogrid (e.g. TriAx) and geofabric over the contaminated fill. Areas where no trees are to be planted can include the marker layers and 0.2-0.5m of clean soil as noted above. The root ball of the tree should be approximately 0.5m above the marker layer;

Step	Procedure
	• Paved areas – In areas where there is continuous paving (i.e. concrete) the pavement itself is considered to be a suitable capping layer; In areas where non-continuous paving is proposed (i.e. brick pavers) the capping should consist of visual marker layer comprising geogrid (e.g. TriAx) and geofabric over the contaminated fill, overlain by pavement materials; and • Underground services – base and walls of service trenches are to be lined with a visual marker layer comprising geofabric over the contaminated fill. Service trenches are to be backfilled with clean (validated) materials. Overlying capping requirements to meet the specification for paved or unpaved areas as noted above. Considering the above, remediation of capped areas will be undertaken as follows: • Once the required levels have been achieved and any piling is complete, the visual marker layer (if required – non-continuous paving and landscaped areas only) should be installed. The contractor should develop an appropriate methodology (to be approved by the validation consultant) for the installation so that the marker materials are appropriately fixed and integrated between the various areas of the site; • The marker layer placement should be inspected by the validation consultant prior to the placement of the overlying clean capping materials. This should be documented photographically; • In any unpaved areas, a levels survey should be completed by a registered surveyor to document the ground levels at the time the visual marker layers are installed (and prior to placement of the clean capping materials); • Any tree pits and service trenches should be inspected and documented by the validation consultant; • Imported capping materials should be validated in accordance with Section 12.5.1; • Construct the capping layers to meet the requirements of the development and address the "minimum acceptable capping standards"; and • Following installation of the capping materials in unpaved areas, a levels survey should be completed by a registered surveyor to document the finished ground levels. This survey will be compared to the previous survey to confirm the minimum capping thickness of 0.5m is achieved in the unpaved areas.

12.4.3 Remediation Documentation

The remediation contractor must retain all documentation associated with the remediation, including but not limited to:

- Soil disposal dockets;
- Imported materials information;
- Photographs of remediation works, including photographs of marker layers prior to placement of the overlying capping materials; and
- Site surveys of any capped areas after the marker layers are installed, and again after the capping layers are constructed.

This documentation must be forwarded to the environmental consultant on completion of the remediation for inclusion in the final validation report.

12.4.4 Soil Disposal - Volume and Disposal Analysis

A soil volume analysis should be undertaken on completion of the works and reconciled with the quantities shown on the soil disposal dockets. A review of the disposal facility's licence issued under the Protection of the Environment Operations (POEO) Act (1997)[18] should also be undertaken to confirm whether or not each facility is appropriately licensed to receive the waste.

12.4.5 Waste Locate Requirements

It is noted that no asbestos contamination was encountered at the site prior to preparation of this RAP. However, if asbestos is encountered within the fill material, the remediation contractor will be required to register with the NSW EPA WasteLocate tracking system to comply with the legislation in regards to transporting/movement of asbestos waste. If the fill contains asbestos, the receiving licenced landfill facility will also need to be registered with the NSW EPA WasteLocate system in order to receive the waste

[18] NSW Government, (1997)). *Protection of Environment Operations Act.* (referred to as POEO Act 1997)

12.5 Validation Plan

Validation is necessary to demonstrate that remedial measures described in this RAP have been successful and that the site is suitable for the intended land use. The validation can be staged if required to permit the various areas of the site to be remediated, validated and signed off progressively.

Validation of the capping works will comprise site inspections to create a photographic record of the cap installation. Following completion of each stage and subsequent inspection, written advice will be prepared and forwarded to the client via email. On completion of the capping works for the entire site, the information will be compiled into a final validation assessment report.

In additional to the site inspections, validation of the capping works should include the following:

- Levels surveys prior to and following placement of capping layers to demonstrate capping thickness;
- Validation of imported materials used as capping (as outlined below); and
- Disposal dockets to be retained for any fill requiring off-site disposal.

Site observations will also be used as a validation tool to assess the extent of site contamination. In particular visual and olfactory indicators such as petroleum odours and staining should be recorded.

12.5.1 Imported Material Requirements

The table below outlines the validation requirements for the site.

Table 12-3: Validation Requirements

Aspect	Sampling	Analysis	Observations and Documentation
Imported VENM backfill	Minimum of three samples per source	Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), TRH, BTEX PAHs, OCP/OPP, PCBs and asbestos	VENM documentation/ report required (should include source site history to demonstrate analytes are appropriate). Additional analysis may be required depending on site history Material to be inspected upon importation to confirm it is free of visible/olfactory indicators of contamination and is consistent with documentation
Imported engineering materials such as recycled aggregate, road base etc	Minimum of three samples per source/material type	Heavy metals (as above), TRHs, BTEX, PAHs, OCP/OPP, PCBs and asbestos	Documentation required to confirm material has been classified with reference to a relevant exemption and is fit for purpose on site

Aspect	Sampling	Analysis	Observations and Documentation
			Material to be inspected upon importation to confirm it is free of visible/olfactory indicators of contamination and is consistent with documentation Dockets for imported material to be provided
Imported engineering materials comprising only natural quarried products such as blue metal etc	At the validation consultants discretion based on supplier documentation	At the validation consultants discretion based on supplier documentation	Documentation to be provided from the supplier confirming the material is a product comprising only VENM (i.e. quarried product) Review of quarry POEO licence Material to be inspected upon importation to confirm it is free of anthropogenic materials, visible and olfactory indicators of contamination, and is consistent with documentation Dockets for imported material to be provided
Imported landscaping materials	Minimum of three samples per source/material type	Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), TRHs, BTEX, PAHs, OCPs, OPPs, PCBs and asbestos	Documentation required to confirm material has been produced under an appropriate standard and is fit for purpose on site Material to be inspected upon importation to confirm it is free of visible/olfactory indicators of contamination and is consistent with documentation Dockets for imported material to be provided

12.5.2 Validation Assessment Criteria and Data Assessment

The validation assessment criteria (VAC) to be adopted for the validation assessment are outlined in the table below:

Table 12-4: VAC

Validation Aspect	Criteria
Site Survey	Each area of the site should be surveyed prior to and on completion of installation of the cap to demonstrate the appropriate thickness of the cap.
Site Inspections	Site inspections will be required to demonstrate effective installation of the capping layer, including appropriate and continuous placement of the marker layer (where required).
Waste classification (soil disposal)	In accordance with the procedures and criteria outlined in Section 8.
Soil validation	HSL-A and HIL-A criteria based on NEPM (2013). HSLs will include the most conservative criteria based on sand and 0m to 1m depth range. NEPM (2013) EIL/ESL criteria will be considered for validation samples collected in proposed landscaped areas. Aesthetics: soils to be free of staining and odours
Imported materials	Heavy metal concentrations to be consistent with background range, organic compounds to be less than the laboratory PQLs and asbestos to be absent. Imported landscaping materials are also to consider EILs and ESLs based on NEPM 2013. Aesthetics: soils to be free of staining and odours
Imported materials	Heavy metal concentrations to be consistent with background range, organic compounds to be less than the laboratory PQLs and asbestos to be absent. Imported landscaping materials are also to consider EILs and ESLs based on NEPM 2013. Aesthetics: soils to be free of staining and odours

Site validation data should initially be assessed as above or below the VAC. Statistical analysis may be applied if deemed appropriate by the consultant and undertaken in accordance with the NEPM (2013).

12.5.3 Validation Report

As part of the validation process, a site validation report will be prepared by the environmental/validation consultant. The report will outline the remediation work undertaken at the site and any deviations to the remediation strategy. The report will summarise the results of the

validation assessment and will be prepared in accordance with the Reporting Guidelines 2011. The report should draw conclusions regarding the success of the remediation/validation and the suitability of the site for the proposed development (from a contamination viewpoint).

The site will require on-going management. The validation reporting for these areas will also include the preparation of a long term EMP. The EMP will require public notification via an appropriate mechanism (e.g. land title, Section 10.7, Dial Before You Dig register), and the consent authority is required to provide written confirmation that they accept the EMP.

12.5.4 Data Quality (Excavation and Off-site Disposal Contingency)

Appropriate QA/QC samples should be obtained during the validation and analysed for the contaminants of concern. As a minimum, QA/QC sampling should include duplicates (5% inter-laboratory and 5% intra-laboratory), trip spikes, trip blanks and rinsate samples.

Data Quality Objectives (DQOs) and Data Quality Indicators (DQIs) should be clearly outlined and assessed as part of the validation process. A framework for the DQO and DQI process is outlined below and should be reflected in the validation report.

DQOs should be established for the validation with regards to the seven-step process outlined in the Site Auditor Guidelines 2017 and with reference to USEPA documents Data Quality Objectives Processes for Hazardous Waste Site Investigations (2000) and Guidance on Systematic Planning Using the Data Quality Objectives Process (2006). The seven steps include the following:

- State the problem;
- Identify the decisions/goal of the study;
- Identify information inputs;
- Define the study boundary;
- Develop the analytical approach/decision rule;
- Specify the performance/acceptance criteria; and
- Optimise the design for obtaining the data.

DQIs are to be assessed based on field and laboratory considerations for precision, accuracy, representativeness, completeness and comparability.

12.6 General Contingency Plan

The site is to be terraced as part of the proposed development, with the eastern side of each terrace requiring excavation. In the event significant portions of the site (e.g. at least one full terrace) are excavated into natural soil/bedrock and the client or remediation contractor does not wish to cap the area, there may be scope to use the excavation and off-site disposal to an appropriate facility strategy (Option 4) as a contingency measure and validate that the terrace area has been remediated and validated so that capping and future management are not required. The strategy details have been included to cover this contingency measure.

12.6.1 Remediation Details - Excavation and Off-site Disposal Contingency

The specific remediation details for the excavation and off-site disposal strategy (Option 4) are described in the table below:

Table 12-5: Remediation Details – Excavation and Off-site Disposal Contingency

Step	Procedure
1.	Site Set-Up: Prior to the commencement of excavation, the excavation areas should be clearly marked with spray paint and/or pegs. The proposed depth of excavation should be compared with the estimated fill depth in each area. If the proposed excavation depth extends to or beyond the fill depth then remediation should proceed as below.
2.	PPE and WHS: Check PPE and WHS requirements prior to commencement of remediation works. This should be done daily. The minimum PPE required for the remediation includes the following: • Disposable gloves; • Eye protection; and • Hard hat, covered clothing and steel toed boots. Machinery and equipment should be sprayed with water prior to exiting the site, preferably over the truck bay wash.
3.	Address Stability Issues: Geotechnical advice should be sought regarding the stability of the adjacent structures and/or adjacent areas prior to commencing the excavation (as required).
4.	Removal of fill: Remediation of the area will be undertaken as follows: • Submit an application to dispose of the fill (in accordance with the assigned waste classifications) to a landfill licensed to receive the waste and obtain authorisation to dispose; • The fill material should be excavated down to the surface of the underlying natural soil/bedrock; • Load the fill onto trucks and dispose in accordance with the assigned waste classification;

Step	Procedure
	• Once the excavation reaches the proposed horizontal and vertical limits, obtain validation samples from the walls and base of the excavation (see the validation plan below for more details); • Following removal of all fill from the selected area, the area should be inspected to confirm there are no obvious indicators of contamination such as stained or odorous soil, or residual underground infrastructure. Any unexpected conditions should be considered in the validation sampling program which should be adjusted accordingly; • Validate the natural soil in accordance with the plan outlined in Section 12.6.2; and • All documents including landfill dockets, asbestos air monitoring etc. should be retained and forwarded to the client for inclusion into the validation report prepared.

12.6.2 Validation Sampling and Documentation (Excavation and Off-site Disposal Contingency)

The sampling program for the validation is outlined below. This is the minimum requirement based on conditions anticipated to exist at the site. Additional validation sampling may be required based on site observations made during remediation.

The table below outlines the validation requirements in the event the contingency for removal all fill is implemented.

Table 12-6: Validation Requirements (Excavation and Off-site Disposal Contingency)

Aspect	Sampling	Analysis	Observations and Documentation
Excavation base (following fill removal)	10m grid (1 sample per 100m^2), with additional samples targeting any potentially impacted areas identified during the visual/olfactory assessment The excavation walls are likely to be retained and inaccessible for sampling. In the event soils are exposed on the walls, samples should be collected at a rate of one sample per 10m lineal, with sampling targeting distinct fill profiles	Arsenic, lead and PAHs. Additional sampling and analysis for other heavy metals, TRH/BTEX may be required for VENM/waste classification purposes	Samples to be screened using PID Observations of staining and odour to be recorded Photographs to be taken Disposal dockets to be retained

Aspect	Sampling	Analysis	Observations and Documentation
	based on field observations.		

12.6.3 Unexpected Finds

A review of the proposed remediation works has indicated that the greatest risk that may affect the success of the remediation is an unexpected find. A contingency plan for unexpected finds is outlined below, in conjunction with a selection of other contingencies that may apply to this project.

Residual hazards that may exist at the site would generally be expected to be detectable through visual or olfactory means. At this site, these types of hazards may include: underground tanks, asbestos in soil, and odorous or stained hydrocarbon impacted soils.

The procedure to be followed in the event of an unexpected find is presented below:

- In the event of an unexpected find, all work in the immediate vicinity should cease and the client should be contacted immediately;
- Temporary barricades should be erected to isolate the area from access to the public and works;
- In the event potential asbestos material is encountered, a qualified occupational hygienist and/or asbestos consultant should be contacted;
- The client should engage a qualified environmental consultant to attend the site and assess the extent of remediation that may be required and/or adequately characterise the contamination in order to allow for cap and containment of the material;
- In the event remediation is required, the procedures outlined within this report should be adopted where appropriate, alternatively an additional remediation action plan (RAP) should be prepared;
- An additional sampling and analytical rationale should be established by the consultant and should be implemented with reference to the relevant guideline documents; and
- Appropriate validation sampling should be undertaken and the results should be included in the validation report.

12.6.4 Unexpected Groundwater Contamination

In the event that volatile groundwater contamination is identified during the data gap investigation (or potentially during dewatering activities during construction), a Tier 2 human health risk assessment should be undertaken to establish the risk to the receptors under the proposed development scenario. In the event of significant contamination, an addendum to the RAP may be required to further consider potential groundwater remediation options.

12.6.5 Contingency for Further Groundwater Investigation after Removal of Fill

Further validation/assessment of groundwater may be required if significant staining, odours or soil exceedances of the VAC are identified following removal of the fill, which could suggest a localised point source of groundwater contamination.

12.6.6 Continual Soil Validation Failure

Where validation is undertaken in accordance with the excavation and off-site disposal contingency and sampling indicates that the contaminated material extends further than anticipated, there are two options:

- Re-excavate and re-sample until the validation sample results meet the VAC; or
- Revise the remedial strategy to include the cap and contain approach (if possible).

12.6.7 Importation Failure for VENM or other Imported Materials

Where material to be imported onto the site does not meet the importation acceptance criteria detailed in Section 12.5.1, the only option is to not accept the material. Alternative material must be sourced that meets the importation requirements.

12.6.8 Disposal of Hazardous Waste

Material classed as 'Hazardous Waste' under the Waste Classification Guidelines (2014) may require further assessment and stabilisation prior to off-site disposal. Disposal approval may also be required from the licensed landfill facility. The presence of Hazardous Waste may result in significant delays and additional cost to the project.

12.7 Site Management Plan for Remediation Works

The information outlined in this section of the RAP is for the remediation work only. The client should contact the local consent authority (council or certifier) for specific site management requirements for the overall development of the site.

12.7.1 Interim Site Management

The following interim measures should be adopted:

- Maintain fences to prevent access to the remediation area/site;
- Construct new fences following demolition of the existing buildings where necessary;
- Entrances to the site should be locked to prevent unauthorised access, tipping or dumping on the site;
- Erect appropriate warning signage as required; and
- The requirements detailed in the hazardous building materials survey report and management plan should be implemented, until such time as a clearance certificate has been issued.

12.7.2 Project Contacts

Emergency procedures and contact telephone numbers should be displayed in a prominent position at the site entrance gate and within the main site working areas. The contact details of key project personnel are summarised below.

Table 12-7: Project Contacts

Task	Company	Contact Details
Project Manager	HKA Wassim Hawat	9255 9100
Remediation Contractor	TBA	TBA
Environmental Consultant	Environmental Investigation Services (TBC)	9888 5000
Certifier	TBA	TBA
NSW EPA	Pollution Line	131 555
Emergency Services	Ambulance, Police, Fire	000

12.7.3 Security

Prior to the commencement of site works, fencing should be installed as required to secure the remediation areas. Warning signs should be erected, which outline the PPE required for remediation

work. All excavations should be clearly marked with coloured tape to reduce the risk to site personnel from injury by falling into open excavations.

12.7.4 Timing and Sequencing of Remediation Works

In general, all remedial works should be completed prior to the commencement of site construction and excavation works for the proposed development. In the event that remedial works are undertaken in conjunction with the development, all remediation areas should be clearly marked and covered with builder's plastic (or similar) in order to reduce the dust generation, surface water run-off and/or exposure to receptors.

In the event of unexpected delays, builder's plastic (or similar) should be used to cover the remediation areas in order to reduce the dust generation, surface water run-off and/or exposure to receptors.

12.7.5 Site Soil and Water Management Plan

The earthworks contractor should prepare a detailed soil and water management plan prior to the commencement of site works. Silt fences should be used to control the surface water runoff at all appropriate locations of the site. Reference should be made to the consent conditions for more details.

All stockpiled materials should be placed within an erosion containment boundary with silt fences and sandbags employed to limit sediment movement. The containment area should be located away from drainage lines, gutters, stormwater pits and inlets and the site boundary. No liquid waste or runoff should be discharged to the stormwater or sewerage system without the approval of the appropriate authorities.

12.7.6 Noise and Vibration Control Plan

The guidelines for minimisation of noise on construction sites outlined in Australian Standard AS-2460 (2002)[19] should be adopted. Other measures specified in the consent conditions should also be complied with.

Noise producing machinery and equipment should only be operated between the hours approved by Council (refer to DA consent documents).

All practicable measures should be taken to reduce the generation of noise and vibration to within acceptable limits. In the event that short-term noisy operations are necessary, and where these are likely to affect residences, notifications should be provided to the relevant authorities and the residents by the Project Manager, specifying the expected duration of the noisy works.

[19] Australian Standard, (2002), *AS2460: Acoustics - Measurement of the Reverberation Time in Rooms.*

12.7.7 Dust Control Plan

All practicable measures should be taken to reduce dust emanating from the site. Factors that contribute to dust production are:

- Wind over a cleared surface;
- Wind over stockpiled material; and
- Movement of machinery in unpaved areas.

Visible dust should not be present at the site boundary. Measures to minimise the potential for dust generation include:

- Use of water sprays on unsealed or exposed soil surfaces;
- Covering of stockpiled materials and excavation faces (particularly during periods of site inactivity and/or during windy conditions) or alternatively the erection of hessian fences around stockpiled soil or large exposed areas of soil;
- Establishment of dust screens consisting of a 2m high shade cloth or similar material secured to a chain wire fence;
- Maintenance of dust control measures to keep the facilities in good operating condition;
- Concrete surfaces brushed or washed to remove dust;
- Stopping work during strong winds;
- Loading or unloading of dry soil as close as possible to stockpiles to prevent spreading of loose material around the site; and
- The expanse of cleared land should be kept to a minimum to achieve a clean and economical working environment.

If stockpiles are to remain on-site or an excavation remains open for a period of longer than 3 days, dust monitoring should be undertaken at the site. If excessive dust is generated all site activities should cease until either wind conditions are more acceptable or a revised method of excavation/remediation is developed.

Dust is also produced during the transfer of material to and from the site. All material should be covered during transport and should be properly disposed of on delivery. No material is to be left in an exposed, un-monitored condition.

All equipment and machinery should be brushed or washed down before leaving the site to limit dust and sediment movement off-site. In the event of prolonged rain and lack of paved areas all vehicles should be washed down prior to exit from the site, and any soil or dirt on the wheels of the vehicles removed. Water used to clean the vehicles should be collected and tested prior to appropriate disposal under the Waste Classification Guidelines 2014.

12.7.8 Air Monitoring

At this stage EIS consider that there is no requirement for asbestos air monitoring at the site during remediation works. This requirement should be reviewed if additional contamination is encountered at the site during the works.

12.7.9 Odour Control Plan

All activities undertaken at the site should be completed in a manner that minimises emissions of smoke, fumes and vapour into the atmosphere and any odours arising from the works or stockpiled material should be controlled. Control measures may include:

- Maintenance of construction equipment so that exhaust emissions comply with the Clean Air Regulations issued under the POEO Act 1997[20];
- Demolition materials and other combustible waste should not be burnt on site;
- The spraying of an appropriate product if required to suppress any odours that may be generated by excavated materials; and
- Use of protective covers (e.g. HDPE).

All practicable measures should be taken to reduce fugitive emissions emanating from the site so that associated odours do not constitute a nuisance and that the ambient air quality is not adversely impacted.

Disturbance of hydrocarbon contaminated soils is likely to result in odorous conditions. The following odour management plan should be implemented to limit the exposure of site personnel and surrounding residents to unpleasant odours:

- Excavation and stockpiling of material should be scheduled during periods with low winds if possible;
- Biosolve or a similar product should be sprayed on material during excavation and following stockpiling to reduce odours;
- All complaints from workers and neighbours should be logged and a response provided. Work should be rescheduled as necessary to minimise odour problems;
- The site foreman should consider the following odour control measures as outlined in NEPM 2013:
  - reduce the exposed surface of the odorous materials;
  - time excavation activities to reduce off-site nuisance (particularly during strong winds); and
  - cover exposed excavation faces overnight or during periods of low excavation activity.
- If continued complaints are received, alternative odour management strategies should be considered and implemented.

[20] NSW Government, (1997), *Protection of Environment Operations Act.* (referred to as POEO Act 1997)

12.7.10 Health and Safety Plan

A site specific WHS plan should be prepared by the contractor for all work to be undertaken at the site. The WHS plan should meet all the requirements outlined in SafeWork NSW WHS regulations.

As a minimum requirement, personnel must wear appropriate protective clothing, including long sleeve shirts, long trousers and steel cap boots. Gloves should be worn when working on remediation activities. Washroom and lunchroom facilities should also be provided to allow workers to remove potential contamination from their hands and clothing prior to eating or drinking.

12.7.11 Waste Management

Prior to commencement of remedial works and excavation for the proposed development, the contractor should develop a waste management or recycling plan to minimise the amount of waste produced by the site. This should, as a minimum, include measures to recycle and re-use excavated material wherever possible.

12.7.12 Incident Management Contingency

The environmental consultant engaged to undertake the validation assessment should be contacted if any unexpected conditions are encountered at the site. This should enable the scope of remedial/validation works to be adjusted as required. Similarly if any incident occurs on site, the environmental consultant should be advised to assess potential impacts on site contamination conditions and the remediation/validation timetable.

12.7.13 Hours of Operation

Hours of operation should be between those approved by Council under the development approval process. Reference should also be made to any specific conditions imposed by other consent authority/regulatory bodies.

13 CONCLUSION

EIS are of the opinion that the site can be made suitable for the proposed development provided this RAP is implemented accordingly. A site validation report and EMP should be prepared on completion of remediation activities.

13.1 Remediation Category

Site remediation can fall under the following two categories outlined in SEPP55:

Table 13-1: Remediation Category

Category	Details
Category 1	Category 1 remediation works are those undertaken in the following areas specified under Clause 9 of SEPP55: A designated development; • Carried out on land declared to be a critical habitat; • Development for which another SEPP or REP requires a development consent; or • Carried out in an area or zone classified as: ➢ Coastal Protection ➢ Conservation or heritage conservation ➢ Habitat protection, or habitat or wildlife corridor ➢ Environmental protection; ➢ Escarpment, escarpment protection or preservation; ➢ Floodway or wetland; ➢ Nature reserve, scenic area or scenic protection; etc. • Work that is not carried out in accordance with the site management provisions contained in the consent authority Development Control Plan (DCP)/Local Environmental Plan (LEP) etc. Approval is required from the consent authority for Category 1 remediation work. The RAP needs to be assessed and determined either as part of the existing DA or as a new and separate DA. Category 1 remediation work is identified as advertised development work unless the remediation work is a designated development or a state significant development (Part 6 of EPAA Regulation 1994).
Category 2	Remediation works which do not fall under the above category are classed as Category 2. Development consent is not required for Category 2 remediation works, however the consent authority should be given 30 days' notice prior to commencement of works.

Considering the above, EIS understand that the remediation work is Category 2 remediation. However, it is noted that the RAP is likely to be assessed by Council as part of the development application/consent process. The remediation category should be reviewed by an experienced planner or similar prior to commencement of works.

13.2 Regulatory Requirements

The regulatory requirements applicable for the site are outlined in the following table:

Table 13-2: Regulatory Requirement

Guideline	Applicability
Duty to Report Contamination (2015)[21]	At this stage, EIS consider that there is no requirement to notify the NSW EPA of the site contamination. This requirement should be reassessed following review of the validation results.
Public Notification of EMP	The EMP will require public notification under Section 10.7 of the EPAA 1979 or a covenant registered on the title to land under Section 88B of the Conveyancing Act *1919*.
POEO Act 1997	Section 143 of the POEO Act 1997 states that if waste is transported to a place that cannot lawfully be used as a waste facility for that waste, then the transporter and owner of the waste are each guilty of an offence. The transporter and owner of the waste have a duty to ensure that the waste is disposed of in an appropriate manner. Appropriate waste tracking is required for all waste that is disposed off-site.

[21] NSW EPA, (2015). *Guidelines on the Duty to Report Contamination under the Contamination Land Management Act 1997.* (referred to as Duty to Report Contamination 2015)

14 LIMITATIONS

The report limitations are outlined below:

- EIS accepts no responsibility for any unidentified contamination issues at the site. Any unexpected problems/subsurface features that may be encountered during development works should be inspected by an environmental consultant as soon as possible;
- Previous use of this site may have involved excavation for the foundations of buildings, services, and similar facilities. In addition, unrecorded excavation and burial of material may have occurred on the site. Backfilling of excavations could have been undertaken with potentially contaminated material that may be discovered in discrete, isolated locations across the site during construction work;
- This report has been prepared based on site conditions which existed at the time of the investigation; scope of work and limitation outlined in the EIS proposal; and terms of contract between EIS and the client (as applicable);
- The conclusions presented in this report are based on investigation of conditions at specific locations, chosen to be as representative as possible under the given circumstances, visual observations of the site and immediate surrounds and documents reviewed as described in the report;
- Subsurface soil and rock conditions encountered between investigation locations may be found to be different from those expected. Groundwater conditions may also vary, especially after climatic changes;
- The investigation and preparation of this report have been undertaken in accordance with accepted practice for environmental consultants, with reference to applicable environmental regulatory authority and industry standards, guidelines and the assessment criteria outlined in the report;
- Where information has been provided by third parties, EIS has not undertaken any verification process, except where specifically stated in the report;
- EIS has not undertaken any assessment of off-site areas that may be potential contamination sources or may have been impacted by site contamination, except where specifically stated in the report;
- EIS accept no responsibility for potentially asbestos containing materials that may exist at the site. These materials may be associated with demolition of pre-1990 constructed buildings or fill material at the site;
- EIS have not and will not make any determination regarding finances associated with the site;
- Additional investigation work may be required in the event of changes to the proposed development or landuse. EIS should be contacted immediately in such circumstances;
- Material considered to be suitable from a geotechnical point of view may be unsatisfactory from a soil contamination viewpoint, and vice versa; and
- This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose.

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IMPORTANT INFORMATION ABOUT THIS REPORT

These notes have been prepared by EIS to assist with the assessment and interpretation of this report.

The Report is based on a Unique Set of Project Specific Factors
This report has been prepared in response to specific project requirements as stated in the EIS proposal document which may have been limited by instructions from the client. This report should be reviewed, and if necessary, revised if any of the following occur:

- The proposed land use is altered;
- The defined subject site is increased or sub-divided;
- The proposed development details including size, configuration, location, orientation of the structures or landscaped areas are modified;
- The proposed development levels are altered, eg addition of basement levels; or
- Ownership of the site changes.

EIS/J&K will not accept any responsibility whatsoever for situations where one or more of the above factors have changed since completion of the assessment. If the subject site is sold, ownership of the assessment report should be transferred by EIS to the new site owners who will be informed of the conditions and limitations under which the assessment was undertaken. No person should apply an assessment for any purpose other than that originally intended without first conferring with the consultant.

Changes in Subsurface Conditions
Subsurface conditions are influenced by natural geological and hydrogeological process and human activities. Groundwater conditions are likely to vary over time with changes in climatic conditions and human activities within the catchment (e.g. water extraction for irrigation or industrial uses, subsurface waste water disposal, construction related dewatering). Soil and groundwater contaminant concentrations may also vary over time through contaminant migration, natural attenuation of organic contaminants, ongoing contaminating activities and placement or removal of fill material. The conclusions of an assessment report may have been affected by the above factors if a significant period of time has elapsed prior to commencement of the proposed development.

This Report is based on Professional Interpretations of Factual Data
Site assessments identify actual subsurface conditions at the actual sampling locations at the time of the investigation. Data obtained from the sampling and subsequent laboratory analyses, available site history information and published regional information is interpreted by geologists, engineers or environmental scientists and opinions are drawn about the overall subsurface conditions, the nature and extent of contamination, the likely impact on the proposed development and appropriate remediation measures.

Actual conditions may differ from those inferred, because no professional, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than an assessment indicates. Actual conditions in areas not sampled may differ from predictions. Nothing can be done to prevent the unanticipated, but steps can be taken to help minimise the impact. For this reason, site owners should retain the services of their consultants throughout the development stage of the project, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

Assessment Limitations
Although information provided by a site assessment can reduce exposure to the risk of the presence of contamination, no environmental site assessment can eliminate the risk. Even a rigorous professional assessment may not detect all contamination on a site. Contaminants may be present in areas that were not surveyed or sampled, or may migrate to areas which showed no signs of contamination when sampled. Contaminant analysis cannot possibly cover every type of contaminant which may occur; only the most likely contaminants are screened.

Misinterpretation of Site Assessments by Design Professionals

Costly problems can occur when other design professionals develop plans based on misinterpretation of an assessment report. To minimise problems associated with misinterpretations, the environmental consultant should be retained to work with appropriate professionals to explain relevant findings and to review the adequacy of plans and specifications relevant to contamination issues.

Logs Should not be Separated from the Assessment Report

Borehole and test pit logs are prepared by environmental scientists, engineers or geologists based upon interpretation of field conditions and laboratory evaluation of field samples. Logs are normally provided in our reports and these should not be re-drawn for inclusion in site remediation or other design drawings, as subtle but significant drafting errors or omissions may occur in the transfer process. Photographic reproduction can eliminate this problem, however contractors can still misinterpret the logs during bid preparation if separated from the text of the assessment. If this occurs, delays, disputes and unanticipated costs may result. In all cases it is necessary to refer to the rest of the report to obtain a proper understanding of the assessment. Please note that logs with the 'Environmental Log' header are not suitable for geotechnical purposes as they have not been peer reviewed by a Senior Geotechnical Engineer.

To reduce the likelihood of borehole and test pit log misinterpretation, the complete assessment should be available to persons or organisations involved in the project, such as contractors, for their use. Denial of such access and disclaiming responsibility for the accuracy of subsurface information does not insulate an owner from the attendant liability. It is critical that the site owner provides all available site information to persons and organisations such as contractors.

Read Responsibility Clauses Closely

Because an environmental site assessment is based extensively on judgement and opinion, it is necessarily less exact than other disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, model clauses have been developed for use in written transmittals. These are definitive clauses designed to indicate consultant responsibility. Their use helps all parties involved recognise individual responsibilities and formulate appropriate action. Some of these definitive clauses are likely to appear in the environmental site assessment, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to any questions.

REPORT FIGURES

AERIAL IMAGE SOURCE: GOOGLE EARTH PRO 7.1.5.1557
AERIAL IMAGE ©: 2015 GOOGLE INC.

This plan should be read in conjunction with the EIS report.

Title: **SITE LOCATION PLAN**

Location: ULTIMO PUBLIC SCHOOL
189 JONES STREET, ULTIMO, NSW

Report No: E30361KH

Figure No: 1

ENVIRONMENTAL INVESTIGATION SERVICES

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LEGEND

- APPROXIMATE SITE BOUNDARY
- BH (Fill Depth) — BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
- BH/MW(Fill Depth) — BOREHOLE AND GROUND WATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m)

SCALE 0 4 8 12 16 20 METRES 1:400 @A3

This plan should be read in conjunction with the EIS report.

Title: **SAMPLE LOCATION PLAN**

Location: ULTIMO PUBLIC SCHOOL
189 JONES STREET, ULTIMO, NSW

Report No: E30361KH

Figure No: 2

ENVIRONMENTAL INVESTIGATION SERVICES

EIS

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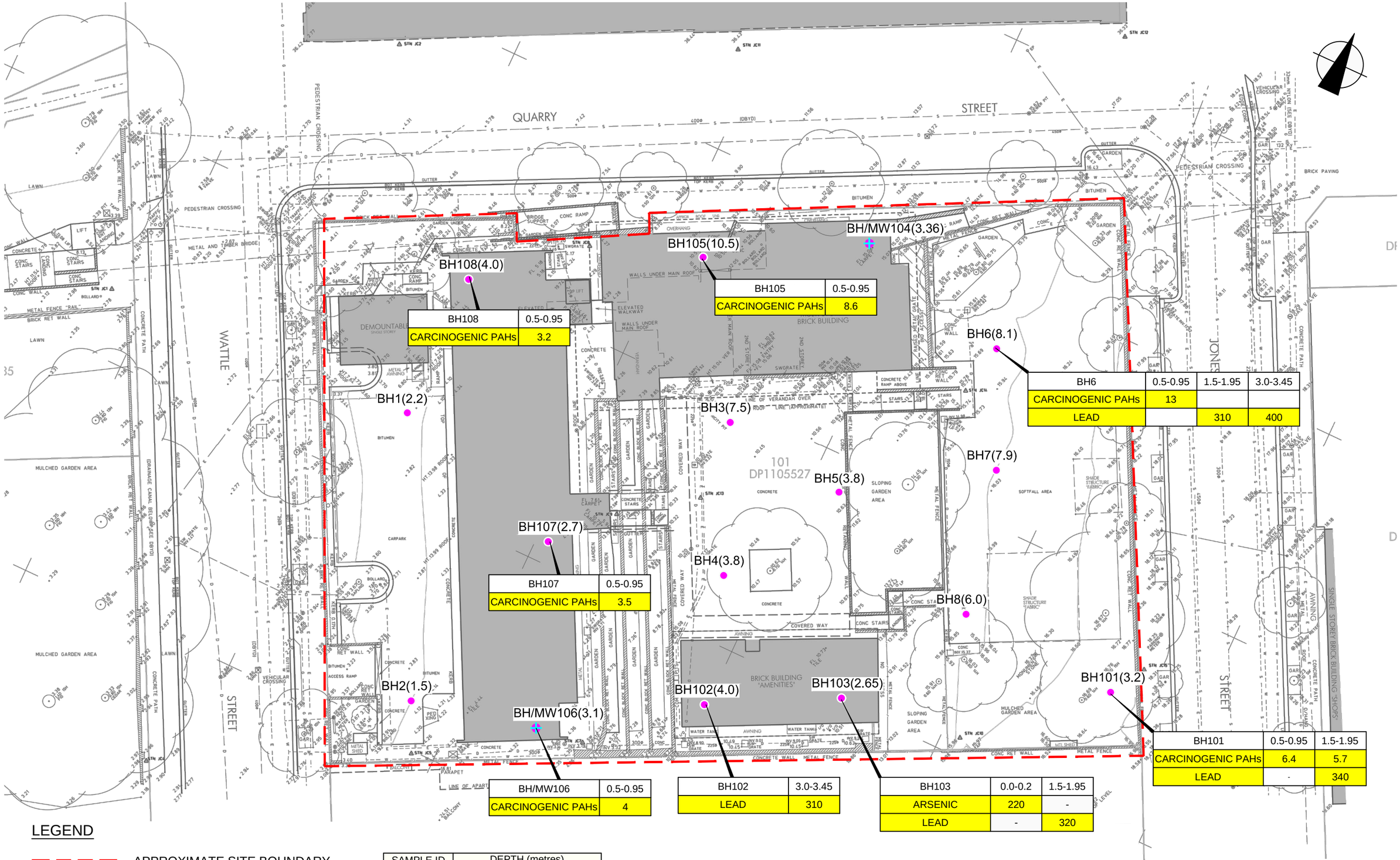

BH108	0.5-0.95
CARCINOGENIC PAHs	3.2

BH105	0.5-0.95
CARCINOGENIC PAHs	8.6

BH6	0.5-0.95	1.5-1.95	3.0-3.45
CARCINOGENIC PAHs	13		
LEAD		310	400

BH107	0.5-0.95
CARCINOGENIC PAHs	3.5

BH/MW106	0.5-0.95
CARCINOGENIC PAHs	4

BH102	3.0-3.45
LEAD	310

BH103	0.0-0.2	1.5-1.95
ARSENIC	220	-
LEAD	-	320

BH101	0.5-0.95	1.5-1.95
CARCINOGENIC PAHs	6.4	5.7
LEAD	-	340

LEGEND

APPROXIMATE SITE BOUNDARY

BH (Fill Depth) — BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)

BH/MW(Fill Depth) — BOREHOLE AND GROUND WATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m)

SAMPLE ID	DEPTH (metres)
CHEMICAL	CONCENTRATION (mg/kg)

SOIL CONTAMINATION ABOVE SAC FOR HUMAN HEALTH RISK

SCALE 1:400 @A3 METRES (0 4 8 12 16 20)

This plan should be read in conjunction with the EIS report.

Title: **SITE CONTAMINATION DATA**

Location: ULTIMO PUBLIC SCHOOL
189 JONES STREET, ULTIMO, NSW

Report No: E30361KH

Figure No: 3

ENVIRONMENTAL INVESTIGATION SERVICES

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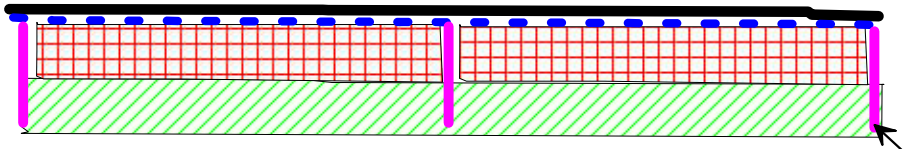
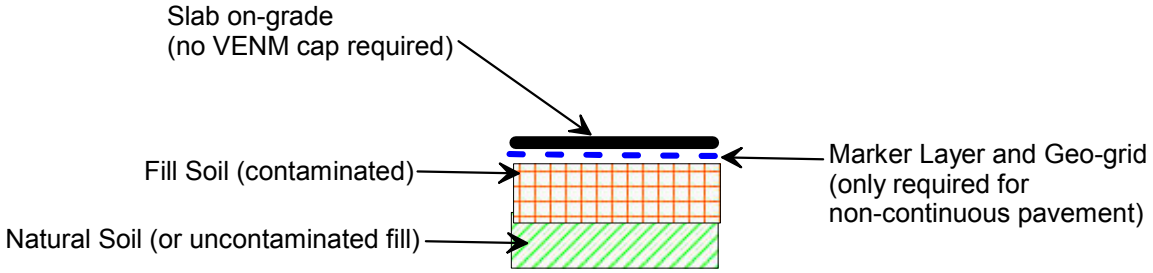
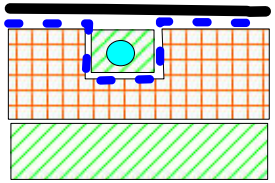


Piles (if required)



Detail for Building Slabs on Existing Ground Level

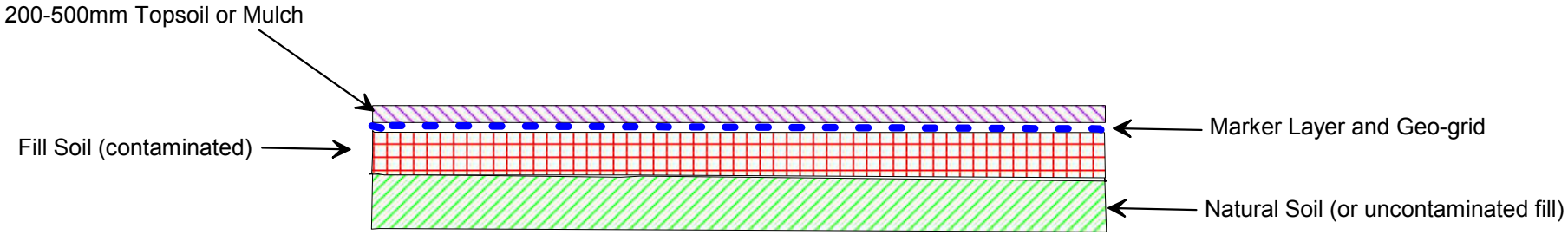


Detail for Service Trenches Beneath Hardstand Areas

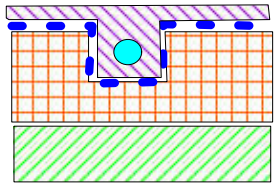
NOTES:
The remediation detail and cross section are indicative only.

Reference should be made to the report text for a full understanding of this plan.

ENVIRONMENTAL INVESTIGATION SERVICES	Project Number: **E30361KH**	Title: **PROPOSED CAPPING IN HARDSTAND AREAS**
	Figure: **4**	Address: **189 JONES STREET, ULTIMO, NSW**



Detail for Capping In Landscaped Areas



Detail for Service Trenches Beneath Landscaped Areas

NOTES:
The remediation detail and cross section are indicative only.

Reference should be made to the report text for a full understanding of this plan.

ENVIRONMENTAL INVESTIGATION SERVICES	Project Number: **E30361KH**	Title: **PROPOSED CAPPING IN LANDSCAPED AREAS**
	Figure: **5**	Address: **189 JONES STREET, ULTIMO, NSW**

LABORATORY SUMMARY TABLES

ABBREVIATIONS AND EXPLANATIONS

Abbreviations used in the Tables:

ABC: Ambient Background Concentration
ACM: Asbestos Containing Material
ADWG: AustralianDrinking Water Guidelines
AF: Asbestos Fines
ANZECC: Australian and New Zealand Environment Conservation Council
B(a)P: Benzo(a)pyrene
CEC: Cation Exchange Capacity
CRC: Cooperative Research Centre
CT: Contaminant Threshold
EILs: Ecological Investigation Levels
ESLs: Ecological Screening Levels
FA: Fibrous Asbestos
GIL: Groundwater Investigation Levels
HILs: Health Investigation Levels
HSLs: Health Screening Levels
HSL-SSA: Health Screening Level-SiteSpecific Assessment
NA: Not Analysed
NC: Not Calculated
NEPM: National Environmental Protection Measure
NHMRC: National Health and Medical Research Council
NL: Not Limiting
NSL: No Set Limit
OCP: Organochlorine Pesticides
OPP: Organophosphorus Pesticides
PAHs: Polycyclic Aromatic Hydrocarbons
ppm: Parts per million
PCBs: Polychlorinated Biphenyls
PCE: Perchloroethylene (Tetrachloroethylene or Teterachloroethene)
pH_{KCL} : pH of filtered 1:20, 1M KCL extract, shaken overnight
pH_{ox} : pH of filtered 1:20 1M KCl after peroxide digestion
PQL: Practical Quantitation Limit
RS: Rinsate Sample
RSL: Regional Screening Levels
SAC: Site Assessment Criteria
SCC: Specific Contaminant Concentration
S_{Cr}: Chromium reducible sulfur
S_{POS}: Peroxide oxidisable Sulfur
SSA: Site Specific Assessment
SSHSLs: Site Specific Health Screening Levels
TAA: Total Actual Acidity in 1M KCL extract titrated to pH6.5
TB: Trip Blank
TCA: 1,1,1 Trichloroethane (methyl chloroform)
TCE: Trichloroethylene (Trichloroethene)
TCLP: Toxicity Characteristics Leaching Procedure
TPA: Total Potential Acidity, 1M KCL peroxide digest
TS: Trip Spike
TRH: Total Recoverable Hydrocarbons
TSA: Total Sulfide Acidity (TPA-TAA)
UCL: Upper Level Confidence Limit on Mean Value
USEPA United States Environmental Protection Agenc
VOCC: Volatile Organic Chlorinated Compounds
WHO: World Health Organisation

Table Specific Explanations:

HIL Tables:

- The chromium results are for Total Chromium which includes Chromium III and VI. For initial screening purposes, we have assumed that the samples contain only Chromium VI unless demonstrated otherwise by additional analysis.
- Carcinogenic PAHs is a toxicity weighted sum of analyte concentrations for a specific list of PAH compounds relative to B(a)P. It is also refered to as the B(a)P Toxic Equivalence Quotient (TEQ).
- Statistical calculations are undertaken using ProUCL (USEPA). Statistical calculation is usually undertaken using data from fill samples.

EIL/ESL Table:

- ABC Values for selected metals have been adopted from the published background concentrations presented in Olszowy et. al., (1995), Trace Element Concentrations in Soils from Rural and Urban New South Wales (the 25th percentile values for old suburbs with high traffic have been quoted).

Waste Classification and TCLP Table:

- Data assessed using the NSW EPA Waste Classification Guidelines, Part 1: Classifying Waste (2014).
- The assessment of Total Moderately Harmful pesticides includes: Dichlorovos, Dimethoate, Fenitrothion, Ethion, Malathion and Parathion.
- Assessment of Total Scheduled pesticides include: HBC, alpha-BHC, gamma-BHC, beta-BHC, Heptachlor, Aldrin, Heptachlor Epoxide, gamma-Chlordane, alpha-chlordane, pp-DDE, Dieldrin, Endrin, pp-DDD, pp-DDT, Endrin Aldehyde.

TABLE A

SOIL LABORATORY RESULTS COMPARED TO NEPM 2013.

HIL-A: 'Residential with garden/accessible soils; children's day care centers; preschools; and primary schools'

All data in mg/kg unless stated otherwise			HEAVY METALS								PAHs		ORGANOCHLORINE PESTICIDES (OCPs)							OP PESTICIDES (OPPs)	TOTAL PCBs	ASBESTOS FIBRES
			Arsenic	Cadmium	Chromium VI	Copper	Lead	Mercury	Nickel	Zinc	Total PAHs	Carcinogenic PAHs	HCB	Endosulfan	Methoxychlor	Aldrin & Dieldrin	Chlordane	DDT, DDD & DDE	Heptachlor	Chlorpyrifos		
PQL - Envirolab Services			4	0.4	1	1	1	0.1	1	1	-	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	100
Site Assessment Criteria (SAC)			100	20	100	6000	300	40	400	7400	300	3	10	270	300	6	50	240	6	1	1	Detected/Not Detected
Sample Reference	**Sample Depth**	**Sample Description**																				
BH101	0-0.2	Fill: silty sand	19	<0.4	18	65	25	<0.1	4	91	0.82	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
BH101	0.5-0.95	Fill: gravelly sand	5	<0.4	27	44	180	0.7	21	250	43	6.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
BH101	1.5-1.95	Fill: gravelly sand	7	<0.4	13	120	340	1.8	13	180	36	5.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
BH102	0-0.2	Fill: silty sand	4	<0.4	6	7	7	<0.1	2	21	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
BH102	0.5-0.95	Fill: silty sand	<4	<0.4	12	28	160	0.8	4	60	0.3	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
BH102	3-3.45	Fill: gravelly sand	12	0.7	9	870	310	1	19	720	3.5	0.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
BH103	0-0.2	Fill: gravelly sand	220	<0.4	16	32	77	2.2	13	77	5	0.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
BH103	0.5-0.95	Fill: gravelly sand	<4	<0.4	12	26	110	0.5	10	94	5	0.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
BH103	1.5-1.95	Fill: gravelly sand	<4	<0.4	14	32	320	0.5	13	220	3.3	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
BH104	0.5-0.95	Fill: silty clay	8	<0.4	13	11	20	<0.1	2	11	0.2	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
BH104	1.5-1.95	Fill: clayey sand	<4	<0.4	11	6	22	<0.1	2	30	1.8	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
BH104	3-3.45	Fill: clayey sand	7	<0.4	15	37	150	0.8	8	66	8.4	1.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
BH105	0.5-0.95	Fill: sandy clay	5	<0.4	14	46	130	0.5	9	120	58	8.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
BH105	1.5-1.95	Fill: sandy clay	<4	<0.4	14	33	120	0.4	5	58	10	1.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
BH105	4.5-4.95	Fill: clayey sand	<4	<0.4	30	3	13	0.6	2	4	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
BH106	0.5-0.95	Fill: sandy clay	<4	<0.4	11	44	100	0.6	10	400	32	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
BH106	1.5-1.95	Fill: sandy clay	<4	<0.4	11	18	41	0.2	4	180	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
BH106	2.7-3.15	Fill: sandy clay	<4	<0.4	6	62	15	<0.1	2	240	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
BH107	0.5-0.95	Fill: clayey sand	5	<0.4	19	49	130	0.8	14	160	27	3.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
BH107	1.5-1.95	Fill: clayey sand	6	<0.4	13	15	100	0.2	2	49	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
BH107	2.7-2.9	Silty sand	<4	<0.4	6	12	33	<0.1	2	40	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
BH108	0.5-0.95	Fill: sandy clay	5	<0.4	16	38	280	0.6	8	200	22	3.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
BH108	1.5-1.95	Fill: silty sand	8	<0.4	22	7	22	0.2	3	140	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
BH108	4.2-4.65	Sandy clay	<4	<0.4	18	<1	4	<0.1	<1	1	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
Total Number of Samples			24	24	24	24	24	24	24	24	24	24	0	0	0	0	0	0	0	0	0	24
Maximum Value			220	0.7	30	870	340	2.2	21	720	58	8.6	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	NC

Concentration above the SAC **VALUE**

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TABLE B
SOIL LABORATORY RESULTS COMPARED TO HSLs
All data in mg/kg unless stated otherwise

					C_6-C_{10} (F1)	$>C_{10}$-C_{16} (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	Field PID Measurement
PQL - Envirolab Services					25	50	0.2	0.5	1	1	1	ppm
NEPM 2013 HSL Land Use Category					**HSL-A/B:LOW/HIGH DENSITY RESIDENTIAL**							
Sample Reference	**Sample Depth**	**Sample Description**	**Depth Category**	**Soil Category**								
BH101	0-0.2	Fill: silty sand	0m to < 1m	Sand	<25	<50	<0.2	<0.5	<1	<2	<1	0
BH101	0.5-0.95	Fill: gravelly sand	0m to < 1m	Sand	<25	<50	<0.2	<0.5	<1	<2	<1	0
BH101	1.5-1.95	Fill: gravelly sand	0m to < 1m	Sand	<25	<50	<0.2	<0.5	<1	<2	<1	0
BH102	0.5-0.95	Fill: silty sand	0m to < 1m	Sand	<25	<50	<0.2	<0.5	<1	<2	<1	0
BH102	3-3.45	Fill: gravelly sand	0m to < 1m	Sand	<25	<50	<0.2	<0.5	<1	<2	<1	0
BH103	0-0.2	Fill: gravelly sand	0m to < 1m	Sand	<25	<50	<0.2	<0.5	<1	<2	<1	0
BH103	0.5-0.95	Fill: gravelly sand	0m to < 1m	Sand	<25	<50	<0.2	<0.5	<1	<2	<1	0
BH103	1.5-1.95	Fill: gravelly sand	0m to < 1m	Sand	<25	<50	<0.2	<0.5	<1	<2	<1	0
BH104	0.5-0.95	Fill: silty clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<2	<1	0
BH104	1.5-1.95	Fill: clayey sand	0m to < 1m	Sand	<25	<50	<0.2	<0.5	<1	<2	<1	0
BH104	3-3.45	Fill: clayey sand	0m to < 1m	Sand	<25	<50	<0.2	<0.5	<1	<2	<1	0
BH105	0.5-0.95	Fill: sandy clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<2	<1	0
BH105	1.5-1.95	Fill: sandy clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<2	<1	0
BH105	4.5-4.95	Fill: clayey sand	0m to < 1m	Sand	<25	<50	<0.2	<0.5	<1	<2	<1	0
BH106	0.5-0.95	Fill: sandy clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<2	<1	0
BH106	1.5-1.95	Fill: sandy clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<2	<1	0.5
BH106	2.7-3.15	Fill: sandy clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<2	<1	0
BH107	0.5-0.95	Fill: clayey sand	0m to < 1m	Sand	<25	<50	<0.2	<0.5	<1	<2	<1	0
BH107	1.5-1.95	Fill: clayey sand	0m to < 1m	Sand	<25	<50	<0.2	<0.5	<1	<2	<1	0
BH107	2.7-2.9	Silty sand	0m to < 1m	Sand	<25	<50	<0.2	<0.5	<1	<2	<1	0
BH108	0.5-0.95	Fill: sandy clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<2	<1	0
BH108	1.5-1.95	Fill: silty sand	0m to < 1m	Sand	<25	<50	<0.2	<0.5	<1	<2	<1	0
BH108	4.2-4.65	Sandy clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<2	<1	0
BH102	0-0.2	Fill: silty sand	0m to < 1m	Sand	<25	<50	<0.2	<0.5	<1	<2	<1	0
Total Number of Samples					24	24	24	24	24	24	24	24
Maximum Value					<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	0.5

Concentration above the SAC **VALUE**

The guideline corresponding to the elevated value is highlighted in grey in the Site Assessment Criteria Table below

SITE ASSESSMENT CRITERIA

					C_6-C_{10} (F1)	$>C_{10}$-C_{16} (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene
PQL - Envirolab Services					25	50	0.2	0.5	1	1	1
NEPM 2013 HSL Land Use Category					**HSL-A/B:LOW/HIGH DENSITY RESIDENTIAL**						
Sample Reference	**Sample Depth**	**Sample Description**	**Depth Category**	**Soil Category**							
BH101	0-0.2	Fill: silty sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH101	0.5-0.95	Fill: gravelly sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH101	1.5-1.95	Fill: gravelly sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH102	0.5-0.95	Fill: silty sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH102	3-3.45	Fill: gravelly sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH103	0-0.2	Fill: gravelly sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH103	0.5-0.95	Fill: gravelly sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH103	1.5-1.95	Fill: gravelly sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH104	0.5-0.95	Fill: silty clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
BH104	1.5-1.95	Fill: clayey sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH104	3-3.45	Fill: clayey sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH105	0.5-0.95	Fill: sandy clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
BH105	1.5-1.95	Fill: sandy clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
BH105	4.5-4.95	Fill: clayey sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH106	0.5-0.95	Fill: sandy clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
BH106	1.5-1.95	Fill: sandy clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
BH106	2.7-3.15	Fill: sandy clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
BH107	0.5-0.95	Fill: clayey sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH107	1.5-1.95	Fill: clayey sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH107	2.7-2.9	Silty sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH108	0.5-0.95	Fill: sandy clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
BH108	1.5-1.95	Fill: silty sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH108	4.2-4.65	Sandy clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
BH102	0-0.2	Fill: silty sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3

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EIS

TABLE C
SOIL LABORATORY RESULTS COMPARED TO NEPM 2013 EILs AND ESLs
All data in mg/kg unless stated otherwise

Land Use Category				URBAN RESIDENTIAL AND PUBLIC OPEN SPACE																			
							AGED HEAVY METALS-EILs						EILs		ESLs								
				pH	CEC ($cmol_c/kg$)	Clay Content (% clay)	Arsenic	Chromium	Copper	Lead	Nickel	Zinc	Naphthalene	DDT	C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	>C_{16}-C_{34} (F3)	>C_{34}-C_{40} (F4)	Benzene	Toluene	Ethylbenzene	Total Xylenes	B(a)P
PQL - Envirolab Services				-	1	-	4	1	1	1	1	1	0.1	0.1	25	50	100	100	0.2	0.5	1	3	0.05
Ambient Background Concentration (ABC)				-	-	-	NSL	13	28	163	5	122	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL
Sample Reference	**Sample Depth**	**Sample Description**	**Soil Texture**																				
BH101	0-0.2	Fill: silty sand	Coarse	6.8	28	17	19	18	65	25	4	91	<0.1	NA	<25	<50	140	<100	<0.2	<0.5	<1	<2	0.1
BH101	0.5-0.95	Fill: gravelly sand	Coarse	6.8	28	17	5	27	44	180	21	250	<0.1	NA	<25	<50	290	140	<0.2	<0.5	<1	<2	4.4
BH101	1.5-1.95	Fill: gravelly sand	Coarse	6.8	28	17	7	13	120	340	13	180	0.1	NA	<25	<50	180	<100	<0.2	<0.5	<1	<2	3.8
BH102	0.5-0.95	Fill: silty sand	Coarse	6.8	28	17	<4	12	28	160	4	60	<0.1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<2	0.06
BH102	1.5-1.95	Fill: gravelly sand	Coarse	6.8	28	17	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH102	3-3.45	Fill: gravelly sand	Coarse	6.8	28	17	12	9	870	310	19	720	<0.1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<2	0.3
BH103	0-0.2	Fill: gravelly sand	Coarse	6.8	28	17	220	16	32	77	13	77	<0.1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<2	0.52
BH103	0.5-0.95	Fill: gravelly sand	Coarse	6.8	28	17	<4	12	26	110	10	94	<0.1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<2	0.5
BH103	1.5-1.95	Fill: gravelly sand	Coarse	6.8	28	17	<4	14	32	320	13	220	<0.1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<2	0.3
BH104	0-0.2	Fill: silty clay	Fine	7.6	10	24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH104	0.5-0.95	Fill: silty clay	Fine	7.6	10	24	8	13	11	20	2	11	<0.1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<2	0.05
BH104	1.5-1.95	Fill: clayey sand	Coarse	7.6	10	24	<4	11	6	22	2	30	<0.1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<2	0.2
BH104	3-3.45	Fill: clayey sand	Coarse	7.6	10	24	7	15	37	150	8	66	<0.1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<2	0.84
BH105	0.5-0.95	Fill: sandy clay	Fine	7.6	10	24	5	14	46	130	9	120	0.1	NA	<25	<50	240	<100	<0.2	<0.5	<1	<2	5.9
BH105	1.5-1.95	Fill: sandy clay	Fine	7.6	10	24	<4	14	33	120	5	58	<0.1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<2	1
BH105	3-3.45	Fill: clayey sand	Coarse	7.6	10	24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH105	4.5-4.95	Fill: clayey sand	Coarse	7.6	10	24	<4	30	3	13	2	4	<0.1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<0.05
BH105	5.7-6.15	Fill: clayey sand	Coarse	7.6	10	24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH106	0.5-0.95	Fill: sandy clay	Fine	7.6	10	24	<4	11	44	100	10	400	<0.1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<2	2.7
BH106	1.5-1.95	Fill: sandy clay	Fine	7.6	10	24	<4	11	18	41	4	180	<0.1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<0.05
BH106	2.7-3.15	Fill: sandy clay	Fine	7.6	10	24	<4	6	62	15	2	240	<0.1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<0.05
BH107	0.5-0.95	Fill: clayey sand	Coarse	7.6	10	24	5	19	49	130	14	160	<0.1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<2	2.4
BH107	1.5-1.95	Fill: clayey sand	Coarse	7.6	10	24	6	13	15	100	2	49	<0.1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<0.05
BH107	2.7-2.9	Silty sand	Coarse	6.8	28	17	<4	6	12	33	2	40	<0.1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<0.05
BH108	0.5-0.95	Fill: sandy clay	Fine	7.6	10	24	5	16	38	280	8	200	<0.1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<2	2.2
BH108	1.5-1.95	Fill: silty sand	Coarse	6.8	28	17	8	22	7	22	3	140	<0.1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<0.05
BH108	4.2-4.65	Sandy clay	Fine	7.6	10	24	<4	18	<1	4	<1	1	<0.1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<0.05
BH102	0-0.2	Fill: silty sand	Coarse	6.8	28	17	4	6	7	7	2	21	<0.1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<0.05
Total Number of Samples				28	28	28	24	24	24	24	24	24	24	0	24	24	24	24	24	24	24	24	24
Maximum Value				7.6	28	24	220	30	870	340	21	720	0.1	<PQL	<PQL	<PQL	290	140	<PQL	<PQL	<PQL	<PQL	5.9

Concentration above the SAC — VALUE

The guideline corresponding to the elevated value is highlighted in grey in the EIL and ESL Assessment Criteria Table below

EIL AND ESL ASSESSMENT CRITERIA

Land Use Category				URBAN RESIDENTIAL AND PUBLIC OPEN SPACE																			
							AGED HEAVY METALS-EILs						EILs		ESLs								
				pH	CEC ($cmol_c/kg$)	Clay Content (% clay)	Arsenic	Chromium	Copper	Lead	Nickel	Zinc	Naphthalene	DDT	C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	>C_{16}-C_{34} (F3)	>C_{34}-C_{40} (F4)	Benzene	Toluene	Ethylbenzene	Total Xylenes	B(a)P
PQL - Envirolab Services				-	1	-	4	1	1	1	1	1	0.1	0.1	25	50	100	100	0.2	0.5	1	3	0.05
Ambient Background Concentration (ABC)				-	-	-	NSL	13	28	163	5	122	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL
Sample Reference	**Sample Depth**	**Sample Description**	**Soil Texture**																				
BH101	0-0.2	Fill: silty sand	Coarse	6.8	28	17	100	413	248	1263	355	1002	170	--	180	120	300	2800	50	85	70	105	33
BH101	0.5-0.95	Fill: gravelly sand	Coarse	6.8	28	17	100	413	248	1263	355	1002	170	--	180	120	300	2800	50	85	70	105	33
BH101	1.5-1.95	Fill: gravelly sand	Coarse	6.8	28	17	100	413	248	1263	355	1002	170	--	180	120	300	2800	50	85	70	105	33
BH102	0.5-0.95	Fill: silty sand	Coarse	6.8	28	17	100	413	248	1263	355	1002	170	--	180	120	300	2800	50	85	70	105	33
BH102	1.5-1.95	Fill: gravelly sand	Coarse	6.8	28	17	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BH102	3-3.45	Fill: gravelly sand	Coarse	6.8	28	17	100	413	248	1263	355	1002	170	--	180	120	300	2800	50	85	70	105	33
BH103	0-0.2	Fill: gravelly sand	Coarse	6.8	28	17	100	413	248	1263	355	1002	170	--	180	120	300	2800	50	85	70	105	33
BH103	0.5-0.95	Fill: gravelly sand	Coarse	6.8	28	17	100	413	248	1263	355	1002	170	--	180	120	300	2800	50	85	70	105	33
BH103	1.5-1.95	Fill: gravelly sand	Coarse	6.8	28	17	100	413	248	1263	355	1002	170	--	180	120	300	2800	50	85	70	105	33
BH104	0-0.2	Fill: silty clay	Fine	7.6	10	24	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BH104	0.5-0.95	Fill: silty clay	Fine	7.6	10	24	100	413	218	1263	175	522	170	--	180	120	1300	5600	60	105	125	45	33
BH104	1.5-1.95	Fill: clayey sand	Coarse	7.6	10	24	100	413	218	1263	175	522	170	--	180	120	300	2800	50	85	70	105	33
BH104	3-3.45	Fill: clayey sand	Coarse	7.6	10	24	100	413	218	1263	175	522	170	--	180	120	300	2800	50	85	70	105	33
BH105	0.5-0.95	Fill: sandy clay	Fine	7.6	10	24	100	413	218	1263	175	522	170	--	180	120	1300	5600	60	105	125	45	33
BH105	1.5-1.95	Fill: sandy clay	Fine	7.6	10	24	100	413	218	1263	175	522	170	--	180	120	1300	5600	60	105	125	45	33
BH105	3-3.45	Fill: clayey sand	Coarse	7.6	10	24	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BH105	4.5-4.95	Fill: clayey sand	Coarse	7.6	10	24	100	413	218	1263	175	522	170	--	180	120	300	2800	50	85	70	105	33
BH105	5.7-6.15	Fill: clayey sand	Coarse	7.6	10	24	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BH106	0.5-0.95	Fill: sandy clay	Fine	7.6	10	24	100	413	218	1263	175	522	170	--	180	120	1300	5600	60	105	125	45	33
BH106	1.5-1.95	Fill: sandy clay	Fine	7.6	10	24	100	413	218	1263	175	522	170	--	180	120	1300	5600	60	105	125	45	33
BH106	2.7-3.15	Fill: sandy clay	Fine	7.6	10	24	100	413	218	1263	175	522	170	--	180	120	1300	5600	60	105	125	45	33
BH107	0.5-0.95	Fill: clayey sand	Coarse	7.6	10	24	100	413	218	1263	175	522	170	--	180	120	300	2800	50	85	70	105	33
BH107	1.5-1.95	Fill: clayey sand	Coarse	7.6	10	24	100	413	218	1263	175	522	170	--	180	120	300	2800	50	85	70	105	33
BH107	2.7-2.9	Silty sand	Coarse	6.8	28	17	100	413	248	1263	355	1002	170	--	180	120	300	2800	50	85	70	105	33
BH108	0.5-0.95	Fill: sandy clay	Fine	7.6	10	24	100	413	218	1263	175	522	170	--	180	120	1300	5600	60	105	125	45	33
BH108	1.5-1.95	Fill: silty sand	Coarse	6.8	28	17	100	413	248	1263	355	1002	170	--	180	120	300	2800	50	85	70	105	33
BH108	4.2-4.65	Sandy clay	Fine	7.6	10	24	100	413	218	1263	175	522	170	--	180	120	1300	5600	60	105	125	45	33
BH102	0-0.2	Fill: silty sand	Coarse	6.8	28	17	100	413	248	1263	355	1002	170	--	180	120	300	2800	50	85	70	105	33

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TABLE D
SOIL LABORATORY RESULTS COMPARED TO WASTE CLASSIFICATION GUIDELINES
All data in mg/kg unless stated otherwise

			HEAVY METALS								PAHs		OC/OP PESTICIDES				Total PCBs	TRH					BTEX COMPOUNDS				ASBESTOS FIBRES
			Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Total PAHs	B(a)P	Total Endosulfans	Chloropyrifos	Total Moderately Harmful	Total Scheduled		C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	Total C_{10}-C_{36}	Benzene	Toluene	Ethyl benzene	Total Xylenes	
PQL - Envirolab Services			4	0.4	1	1	1	0.1	1	1	-	0.05	0.1	0.1	0.1	0.1	0.1	25	50	100	100	250	0.2	0.5	1	3	100
General Solid Waste CT1			100	20	100	NSL	100	4	40	NSL	200	0.8	60	4	250	<50	<50	650		NSL		10,000	10	288	600	1,000	-
General Solid Waste SCC1			500	100	1900	NSL	1500	50	1050	NSL	200	10	108	7.5	250	<50	<50	650		NSL		10,000	18	518	1,080	1,800	-
Restricted Solid Waste CT2			400	80	400	NSL	400	16	160	NSL	800	3.2	240	16	1000	<50	<50	2600		NSL		40,000	40	1,152	2,400	4,000	-
Restricted Solid Waste SCC2			2000	400	7600	NSL	6000	200	4200	NSL	800	23	432	30	1000	<50	<50	2600		NSL		40,000	72	2,073	4,320	7,200	-
Sample Reference	**Sample Depth**	**Sample Description**																									
BH101	0-0.2	Fill: silty sand	19	<0.4	18	65	25	<0.1	4	91	0.82	0.1	NA	NA	NA	NA	NA	<25	<50	<100	120	120	<0.2	<0.5	<1	<2	Not Detected
BH101	0.5-0.95	Fill: gravelly sand	5	<0.4	27	44	**180**	0.7	21	250	43	**4.4**	NA	NA	NA	NA	NA	<25	<50	140	180	320	<0.2	<0.5	<1	<2	Not Detected
BH101	1.5-1.95	Fill: gravelly sand	7	<0.4	13	120	**340**	1.8	13	180	36	**3.8**	NA	NA	NA	NA	NA	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<2	Not Detected
BH102	0.5-0.95	Fill: silty sand	<4	<0.4	12	28	**160**	0.8	4	60	0.3	0.06	NA	NA	NA	NA	NA	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<2	Not Detected
BH102	1.5-1.95	Fill: gravelly sand	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH102	3-3.45	Fill: gravelly sand	12	0.7	9	870	**310**	1	19	720	3.5	0.3	NA	NA	NA	NA	NA	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<2	Not Detected
BH103	0-0.2	Fill: gravelly sand	**220**	<0.4	16	32	77	2.2	13	77	5	0.52	NA	NA	NA	NA	NA	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<2	Not Detected
BH103	0.5-0.95	Fill: gravelly sand	<4	<0.4	12	26	**110**	0.5	10	94	5	0.5	NA	NA	NA	NA	NA	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<2	Not Detected
BH103	1.5-1.95	Fill: gravelly sand	<4	<0.4	14	32	**320**	0.5	13	220	3.3	0.3	NA	NA	NA	NA	NA	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<2	Not Detected
BH104	0-0.2	Fill: silty clay	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH104	0.5-0.95	Fill: silty clay	8	<0.4	13	11	20	<0.1	2	11	0.2	0.05	NA	NA	NA	NA	NA	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<2	Not Detected
BH104	1.5-1.95	Fill: clayey sand	<4	<0.4	11	6	22	<0.1	2	30	1.8	0.2	NA	NA	NA	NA	NA	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<2	Not Detected
BH104	3-3.45	Fill: clayey sand	7	<0.4	15	37	**150**	0.8	8	66	8.4	**0.84**	NA	NA	NA	NA	NA	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<2	Not Detected
BH105	0.5-0.95	Fill: sandy clay	5	<0.4	14	46	**130**	0.5	9	120	58	**5.9**	NA	NA	NA	NA	NA	<25	<50	150	100	250	<0.2	<0.5	<1	<2	Not Detected
BH105	1.5-1.95	Fill: sandy clay	<4	<0.4	14	33	**120**	0.4	5	58	10	**1**	NA	NA	NA	NA	NA	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<2	Not Detected
BH105	3-3.45	Fill: clayey sand	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH105	4.5-4.95	Fill: clayey sand	<4	<0.4	30	3	13	0.6	2	4	<0.05	<0.05	NA	NA	NA	NA	NA	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<2	Not Detected
BH105	5.7-6.15	Fill: clayey sand	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH106	0.5-0.95	Fill: sandy clay	<4	<0.4	11	44	100	0.6	10	400	32	**2.7**	NA	NA	NA	NA	NA	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<2	Not Detected
BH106	1.5-1.95	Fill: sandy clay	<4	<0.4	11	18	41	0.2	4	180	<0.05	<0.05	NA	NA	NA	NA	NA	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<2	Not Detected
BH106	2.7-3.15	Fill: sandy clay	<4	<0.4	6	62	15	<0.1	2	240	<0.05	<0.05	NA	NA	NA	NA	NA	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<2	Not Detected
BH107	0.5-0.95	Fill: clayey sand	5	<0.4	19	49	**130**	0.8	14	160	27	**2.4**	NA	NA	NA	NA	NA	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<2	Not Detected
BH107	1.5-1.95	Fill: clayey sand	6	<0.4	13	15	100	0.2	2	49	<0.05	<0.05	NA	NA	NA	NA	NA	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<2	Not Detected
BH107	2.7-2.9	Silty sand	<4	<0.4	6	12	33	<0.1	2	40	<0.05	<0.05	NA	NA	NA	NA	NA	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<2	Not Detected
BH108	0.5-0.95	Fill: sandy clay	5	<0.4	16	38	**280**	0.6	8	200	22	**2.2**	NA	NA	NA	NA	NA	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<2	Not Detected
BH108	1.5-1.95	Fill: silty sand	8	<0.4	22	7	22	0.2	3	140	<0.05	<0.05	NA	NA	NA	NA	NA	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<2	Not Detected
BH108	4.2-4.65	Sandy clay	<4	<0.4	18	<1	4	<0.1	<1	1	<0.05	<0.05	NA	NA	NA	NA	NA	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<2	Not Detected
BH102	0-0.2	Fill: silty sand	4	<0.4	6	7	7	<0.1	2	21	<0.05	<0.05	NA	NA	NA	NA	NA	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<2	Not Detected
Total Number of samples			24	24	24	24	24	24	24	24	24	24	0	0	0	0	0	24	24	24	24	24	24	24	24	24	24
Maximum Value			220	0.7	30	870	340	2.2	21	720	58	5.9	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	150	180	320	<PQL	<PQL	<PQL	<PQL	NC

Concentration above the CT1 — VALUE
Concentration above SCC1 — VALUE
Concentration above the SCC2 — VALUE

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TABLE E

SOIL LABORATORY TCLP RESULTS

All data in mg/L unless stated otherwise

			Arsenic	Lead	B(a)P
PQL - Envirolab Services			0.05	0.03	0.001
TCLP1 - General Solid Waste			5	5	0.04
TCLP2 - Restricted Solid Waste			20	20	0.16
TCLP3 - Hazardous Waste			>20	>20	>0.16
Sample Reference	**Sample Depth**	**Sample Description**			
BH101	0.5-0.95	Fill: gravelly sand	NA	0.08	<0.001
BH101	1.5-1.95	Fill: gravelly sand	NA	0.09	<0.001
BH102	0.5-0.95	Fill: silty sand	NA	0.06	NA
BH102	3-3.45	Fill: gravelly sand	NA	0.2	NA
BH103	0-0.2	Fill: gravelly sand	<0.05	NA	NA
BH103	0.5-0.95	Fill: gravelly sand	NA	0.04	NA
BH103	1.5-1.95	Fill: gravelly sand	NA	0.33	NA
BH104	3-3.45	Fill: clayey sand	NA	0.07	<0.001
BH105	0.5-0.95	Fill: sandy clay	NA	0.06	<0.001
BH105	1.5-1.95	Fill: sandy clay	NA	<0.03	<0.001
BH106	0.5-0.95	Fill: sandy clay	NA	NA	<0.001
BH107	0.5-0.95	Fill: clayey sand	NA	<0.03	<0.001
BH108	0.5-0.95	Fill: sandy clay	NA	0.06	<0.001
Total Number of samples			1	11	8
Maximum Value			<PQL	0.33	<PQL

General Solid Waste	**VALUE**
Restricted Solid Waste	**VALUE**
Hazardous Waste	**VALUE**

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TABLE F

SUMMARY OF LABORATORY RESULTS - ACID SULFATE SOIL ANALYSIS (sPOCAS)

		Analysis	pH_{KCL}	TAA	pH_{ox}	TPA	TSA	S_{POS}	S_{Cr}	Liming Rate
				pH 6.5		pH 6.5	pH 6.5	%w/w	%w/w	kg $CaCO_3$/tonne
Acid Sulfate Soil Manual (1998) -Action Criteria		Coarse Textured Soil	pH 5.0	18molH+/ tonne	pH 5.0	18molH+/ tonne	18molH+/ tonne	0.03% w/w	0.03% w/w	
Sample Reference	**Sample Depth (m)**	**Sample Description**								
BH105	5.5-5.7	Fill: sandy clay	6.0	<5	2.8	85	84	0.08	0.11	3.9
BH106	2-2.5	Fill: sandy clay	8.6	<5	7.3	<5	<5	<0.005	NA	<0.75
BH107	1-1.5	Fill: silty sand	7.2	<5	6.4	<5	<5	<0.005	NA	<0.75
BH107	2.5-2.7	Fill: clayey sand	8.7	<5	7.6	<5	<5	0.006	NA	<0.75
BH108	2.5-2.7	Fill: sandy clay	8.9	<5	7.7	<5	<5	0.005	NA	<0.75
BH108	4-45	Sandy clay	6.0	<5	3.7	65	64	<0.005	NA	<0.75
Total Number of Samples			6	6	6	6	6	6	1	6
Minimum Value			6.0	<PQL	2.8	65	64	0.005	0.11	3.9
Maximum Value			8.9	<PQL	7.7	85	84	0.08	0.11	3.9

Values Exceeding Action Criteria **VALUE**

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TABLE G-1
SOIL INTRA-LABORATORY DUPLICATE RESULTS & RPD CALCULATIONS
All results in mg/kg unless stated otherwise

SAMPLE	ANALYSIS	Envirolab PQL	INITIAL	REPEAT	MEAN	RPD %
Sample Ref = BH101 (0-0.2m)	Arsenic	4	19	4	11.5	130
Dup Ref = Dup 1	Cadmium	0.4	<0.4	<0.4	NC	NC
	Chromium	1	18	7	12.5	88
Envirolab Report: 191242	Copper	1	65	9	37.0	151
	Lead	1	25	8	16.5	103
	Mercury	0.1	<0.1	<0.1	NC	NC
	Nickel	1	4	3	3.5	29
	Zinc	1	91	34	62.5	91
	Naphthalene	0.1	<0.1	<0.1	NC	NC
	Acenaphthylene	0.1	<0.1	<0.1	NC	NC
	Acenaphthene	0.1	<0.1	<0.1	NC	NC
	Fluorene	0.1	<0.1	<0.1	NC	NC
	Phenanthrene	0.1	<0.1	<0.1	NC	NC
	Anthracene	0.1	<0.1	<0.1	NC	NC
	Fluoranthene	0.1	0.2	<0.1	0.1	120
	Pyrene	0.1	0.2	<0.1	0.1	120
	Benzo(a)anthracene	0.1	<0.1	<0.1	NC	NC
	Chrysene	0.1	0.1	<0.1	0.1	67
	Benzo(b,j+k)fluoranthene	0.2	0.2	<0.2	0.2	67
	Benzo(a)pyrene	0.05	0.1	<0.05	0.1	120
	Indeno(123-cd)pyrene	0.1	<0.1	<0.1	NC	NC
	Dibenzo(ah)anthracene	0.1	<0.1	<0.1	NC	NC
	Benzo(ghi)perylene	0.1	<0.1	<0.1	NC	NC
	TRH C_6-C_{10} (F1)	25	<25	<25	NC	NC
	TRH >C_{10}-C_{16} (F2)	50	<50	<50	NC	NC
	TRH >C_{16}-C_{34} (F3)	100	140	<100	95.0	95
	TRH >C_{34}-C_{40} (F4)	100	<100	<100	NC	NC
	Benzene	0.2	<0.2	<0.2	NC	NC
	Toluene	0.5	<0.5	<0.5	NC	NC
	Ethylbenzene	1	<1	<1	NC	NC
	m+p-xylene	2	<2	<2	NC	NC
	o-xylene	1	<1	<1	NC	NC

Explanation:

The RPD value is calculated as the absolute value of the difference between the initial and repeat results divided by the average value expressed as a percentage. The following acceptance criteria will be used to assess the RPD results:

Results > 10 times PQL = RPD value <= 50% are acceptable
Results between 5 & 10 times PQL = RPD value <= 75% are acceptable
Results < 5 times PQL = RPD value <= 100% are acceptable
If result is LPQL then 50% of the PQL is used for the calculation

RPD Results Above the Acceptance Criteria VALUE

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TABLE G-2
SOIL INTRA-LABORATORY DUPLICATE RESULTS & RPD CALCULATIONS
All results in mg/kg unless stated otherwise

SAMPLE	ANALYSIS	Envirolab PQL	INITIAL	REPEAT	MEAN	RPD %
Sample Ref = BH102 (0-0.2m)	Arsenic	4	4	<4	3.0	67
Dup Ref = Dup 2	Cadmium	0.4	<0.4	<0.4	NC	NC
	Chromium	1	6	5	5.5	18
Envirolab Report: 191242	Copper	1	7	7	7.0	0
	Lead	1	7	6	6.5	15
	Mercury	0.1	<0.1	<0.1	NC	NC
	Nickel	1	2	2	2.0	0
	Zinc	1	21	19	20.0	10
	Naphthalene	0.1	<0.1	<0.1	NC	NC
	Acenaphthylene	0.1	<0.1	<0.1	NC	NC
	Acenaphthene	0.1	<0.1	<0.1	NC	NC
	Fluorene	0.1	<0.1	<0.1	NC	NC
	Phenanthrene	0.1	<0.1	<0.1	NC	NC
	Anthracene	0.1	<0.1	<0.1	NC	NC
	Fluoranthene	0.1	<0.1	<0.1	NC	NC
	Pyrene	0.1	<0.1	<0.1	NC	NC
	Benzo(a)anthracene	0.1	<0.1	<0.1	NC	NC
	Chrysene	0.1	<0.1	<0.1	NC	NC
	Benzo(b,j+k)fluoranthene	0.2	<0.2	<0.2	NC	NC
	Benzo(a)pyrene	0.05	<0.05	<0.05	NC	NC
	Indeno(123-cd)pyrene	0.1	<0.1	<0.1	NC	NC
	Dibenzo(ah)anthracene	0.1	<0.1	<0.1	NC	NC
	Benzo(ghi)perylene	0.1	<0.1	<0.1	NC	NC
	TRH C6-C10 (F1)	25	<25	<25	NC	NC
	TRH >C10-C16 (F2)	50	<50	<50	NC	NC
	TRH >C16-C34 (F3)	100	<100	<100	NC	NC
	TRH >C34-C40 (F4)	100	<100	<100	NC	NC
	Benzene	0.2	<0.2	<0.2	NC	NC
	Toluene	0.5	<0.5	<0.5	NC	NC
	Ethylbenzene	1	<1	<1	NC	NC
	m+p-xylene	2	<2	<2	NC	NC
	o-xylene	1	<1	<1	NC	NC

Explanation:

The RPD value is calculated as the absolute value of the difference between the initial and repeat results divided by the average value expressed as a percentage. The following acceptance criteria will be used to assess the RPD results:

Results > 10 times PQL = RPD value <= 50% are acceptable
Results between 5 & 10 times PQL = RPD value <= 75% are acceptable
Results < 5 times PQL = RPD value <= 100% are acceptable
If result is LPQL then 50% of the PQL is used for the calculation

RPD Results Above the Acceptance Criteria VALUE

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TABLE G-3
SOIL INTRA-LABORATORY DUPLICATE RESULTS & RPD CALCULATIONS
All results in mg/kg unless stated otherwise

SAMPLE	ANALYSIS	Envirolab PQL	INITIAL	REPEAT	MEAN	RPD %
Sample Ref = BH107 (0.5-0.95m)	Arsenic	4	5	5	5.0	0
Dup Ref = Dup 3	Cadmium	0.4	<0.4	<0.4	NC	NC
	Chromium	1	19	18	18.5	5
Envirolab Report: 191242	Copper	1	49	47	48.0	4
	Lead	1	130	72	101.0	57
	Mercury	0.1	0.8	0.4	0.6	67
	Nickel	1	14	10	12.0	33
	Zinc	1	160	76	118.0	71
	Naphthalene	0.1	<0.1	0.1	0.1	67
	Acenaphthylene	0.1	0.5	0.9	0.7	57
	Acenaphthene	0.1	<0.1	<0.1	NC	NC
	Fluorene	0.1	0.2	0.2	0.2	0
	Phenanthrene	0.1	2.6	6.6	4.6	87
	Anthracene	0.1	0.8	1.7	1.3	72
	Fluoranthene	0.1	4.6	9.7	7.2	71
	Pyrene	0.1	4.6	9.7	7.2	71
	Benzo(a)anthracene	0.1	2.5	5.5	4.0	75
	Chrysene	0.1	2.2	4.4	3.3	67
	Benzo(b,j+k)fluoranthene	0.2	3.8	6.8	5.3	57
	Benzo(a)pyrene	0.05	2.4	4.6	3.5	63
	Indeno(123-cd)pyrene	0.1	1.1	1.8	1.5	48
	Dibenzo(ah)anthracene	0.1	0.3	0.6	0.5	67
	Benzo(ghi)perylene	0.1	1.3	2.2	1.8	51
	TRH C_6-C_{10} (F1)	25	<25	<25	NC	NC
	TRH >C_{10}-C_{16} (F2)	50	<50	<50	NC	NC
	TRH >C_{16}-C_{34} (F3)	100	<100	230	140.0	129
	TRH >C_{34}-C_{40} (F4)	100	<100	<100	NC	NC
	Benzene	0.2	<0.2	<0.2	NC	NC
	Toluene	0.5	<0.5	<0.5	NC	NC
	Ethylbenzene	1	<1	<1	NC	NC
	m+p-xylene	2	<2	<2	NC	NC
	o-xylene	1	<1	<1	NC	NC

Explanation:

The RPD value is calculated as the absolute value of the difference between the initial and repeat results divided by the average value expressed as a percentage. The following acceptance criteria will be used to assess the RPD results:

Results > 10 times PQL = RPD value <= 50% are acceptable
Results between 5 & 10 times PQL = RPD value <= 75% are acceptable
Results < 5 times PQL = RPD value <= 100% are acceptable
If result is LPQL then 50% of the PQL is used for the calculation

RPD Results Above the Acceptance Criteria VALUE

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TABLE H
SOIL INTER-LABORATORY DUPLICATE RESULTS & RPD CALCULATIONS
All results in mg/kg unless stated otherwise

SAMPLE	ANALYSIS	Envirolab PQL	Envirolab VIC PQL	INITIAL	REPEAT	MEAN	RPD %
Sample Ref = BH108 (0.5-0.95m)	Arsenic	4	4	5	4	4.5	22
Dup Ref = Dup 4	Cadmium	0.4	0.4	<0.4	0.4	0.3	67
	Chromium	1	1	16	11	13.5	37
Envirolab Report: 191242	Copper	1	1	38	15	26.5	87
Envirolab VIC Report: 13773	Lead	1	1	280	45	162.5	145
	Mercury	0.1	0.1	0.6	0.1	0.4	143
	Nickel	1	1	8	7	7.5	13
	Zinc	1	1	200	68	134.0	99
	Naphthalene	0.1	0.1	<0.1	0.1	0.1	67
	Acenaphthylene	0.1	0.1	0.3	0.8	0.6	91
	Acenaphthene	0.1	0.1	<0.1	0.1	0.1	67
	Fluorene	0.1	0.1	<0.1	0.5	0.3	164
	Phenanthrene	0.1	0.1	1.4	5	3.2	113
	Anthracene	0.1	0.1	0.4	1.4	0.9	111
	Fluoranthene	0.1	0.1	3.6	6.6	5.1	59
	Pyrene	0.1	0.1	4	6.4	5.2	46
	Benzo(a)anthracene	0.1	0.1	2	3	2.5	40
	Chrysene	0.1	0.1	2	2.4	2.2	18
	Benzo(b,j+k)fluoranthene	0.2	0.2	3.7	3.6	3.7	3
	Benzo(a)pyrene	0.05	0.05	2.2	2.4	2.3	9
	Indeno(123-cd)pyrene	0.1	0.1	1.1	1.2	1.2	9
	Dibenzo(ah)anthracene	0.1	0.1	0.2	0.3	0.3	40
	Benzo(ghi)perylene	0.1	0.1	1.3	1.3	1.3	0
	TRH C6-C10 (F1)	25	25	<25	<25	NC	NC
	TRH >C10-C16 (F2)	50	50	<50	<50	NC	NC
	TRH >C16-C34 (F3)	100	100	<100	<100	NC	NC
	TRH >C34-C40 (F4)	100	100	<100	<100	NC	NC
	Benzene	0.2	0.2	<0.2	<0.2	NC	NC
	Toluene	0.5	0.5	<0.5	<0.5	NC	NC
	Ethylbenzene	1	1	<1	<1	NC	NC
	m+p-xylene	2	2	<2	<2	NC	NC
	o-xylene	1	1	<1	<1	NC	NC

Explanation:

The RPD value is calculated as the absolute value of the difference between the initial and repeat results divided by the average value expressed as a percentage. The following acceptance criteria will be used to assess the RPD results:

Results > 10 times PQL = RPD value <= 50% are acceptable

Results between 5 & 10 times PQL = RPD value <= 75% are acceptable

Results < 5 times PQL = RPD value <= 100% are acceptable

If result is LPQL then 50% of the PQL is used for the calculation

RPD Results Above the Acceptance Criteria VALUE

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TABLE I

SUMMARY OF FIELD QA/QC RESULTS

ANALYSIS	Envirolab PQL		TB1[S]
			Date
	mg/kg	µg/L	mg/kg
TRH C6-C10 (F1)	10	10	<25
Benzene	1	0.2	<0.2
Toluene	1	0.5	<0.5
Ethylbenzene	1	1	<1
m+p-xylene	2	2	<2
o-xylene	1	1	<1

Explanation:

[W] Sample type (water)

[S] Sample type (sand)

BTEX concentrations in trip spikes are presented as % recovery

Values above PQLs/Acceptance criteria **VALUE**

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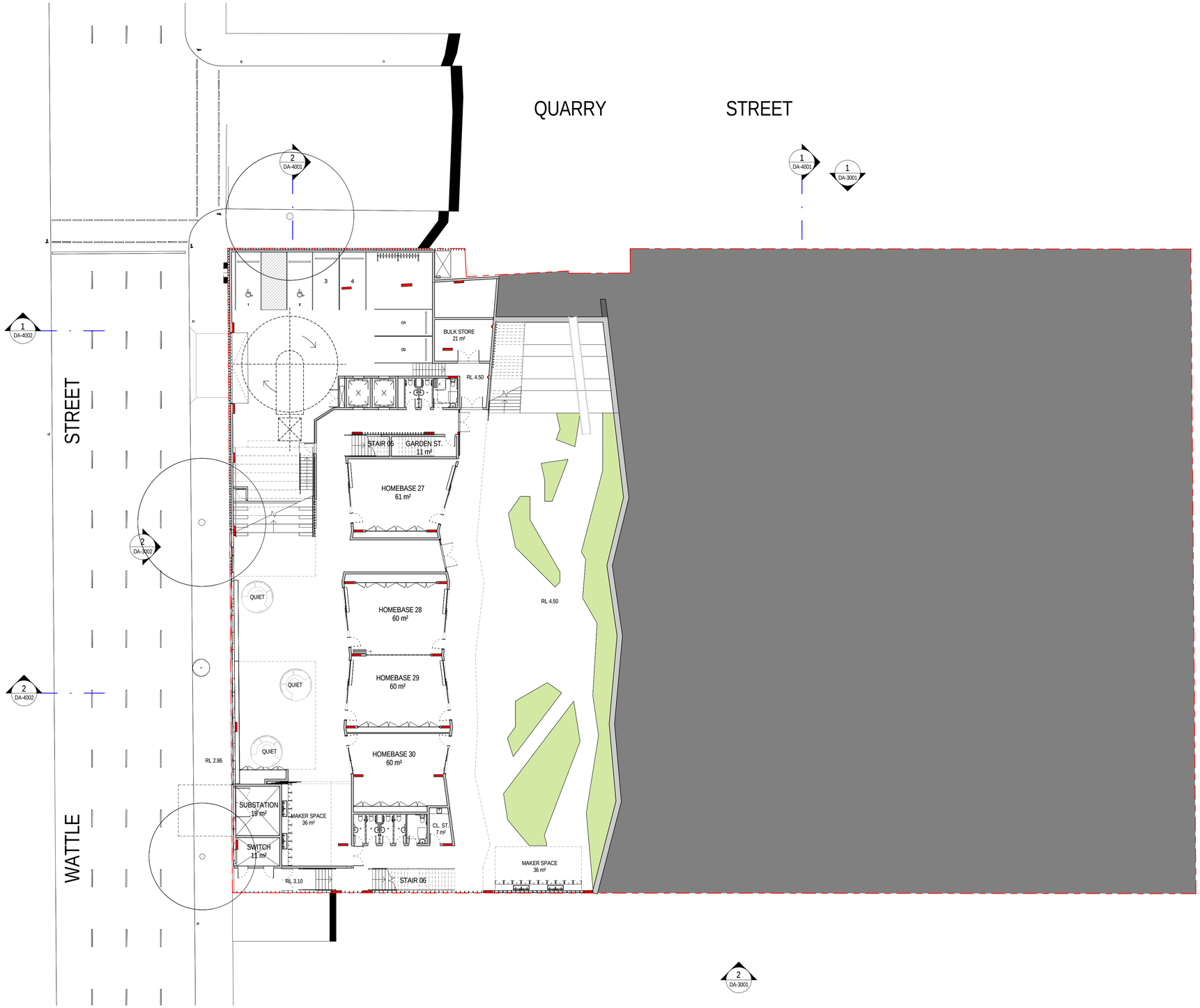
Appendix A: Proposed Development Plans



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ARCHITECTS IN ASSOCIATION
DesignInc | Lacoste +Stevenson | bmc2
DesignInc Sydney PTY LIMITED ACN 003008820
L12 / 77 PACIFIC HWY NORTH SYDNEY NSW 2060
AUSTRALIA
PO BOX 651 NORTH SYDNEY NSW 2059
AUSTRALIA
T +612 8905 7100 F +612 8905 7199
E sydney@sydney.designinc.com.au
www.designinc.com.au
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PROJECT: ULTIMO PYRMONT PUBLIC SCHOOL REDEVELOPMENT
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TITLE: GROUND - LOWER PLAYGROUND
GENERAL ARRANGEMENT PLAN - RL 4.60

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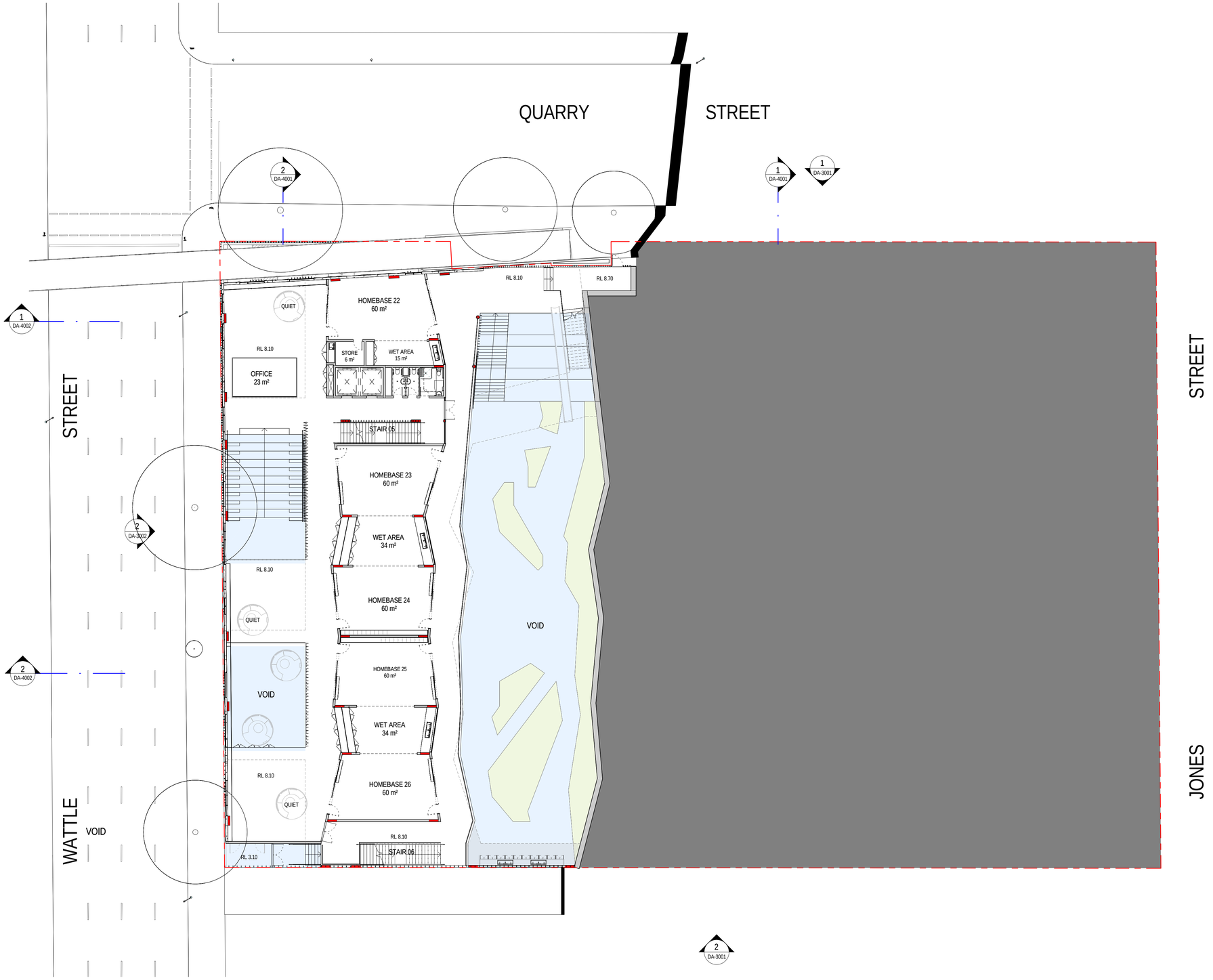

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L12 / 77 PACIFIC HWY NORTH SYDNEY NSW 2060
AUSTRALIA
PO BOX 651 NORTH SYDNEY NSW 2059
AUSTRALIA
T +612 8905 7100 F +612 8905 7199
E sydney@sydney.designinc.com.au
www.designinc.com.au
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PROJECT: ULTIMO PYRMONT PUBLIC SCHOOL REDEVELOPMENT

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TITLE: LEVEL 01 - LIBRARY

GENERAL ARRANGEMENT PLAN - RL 8.10

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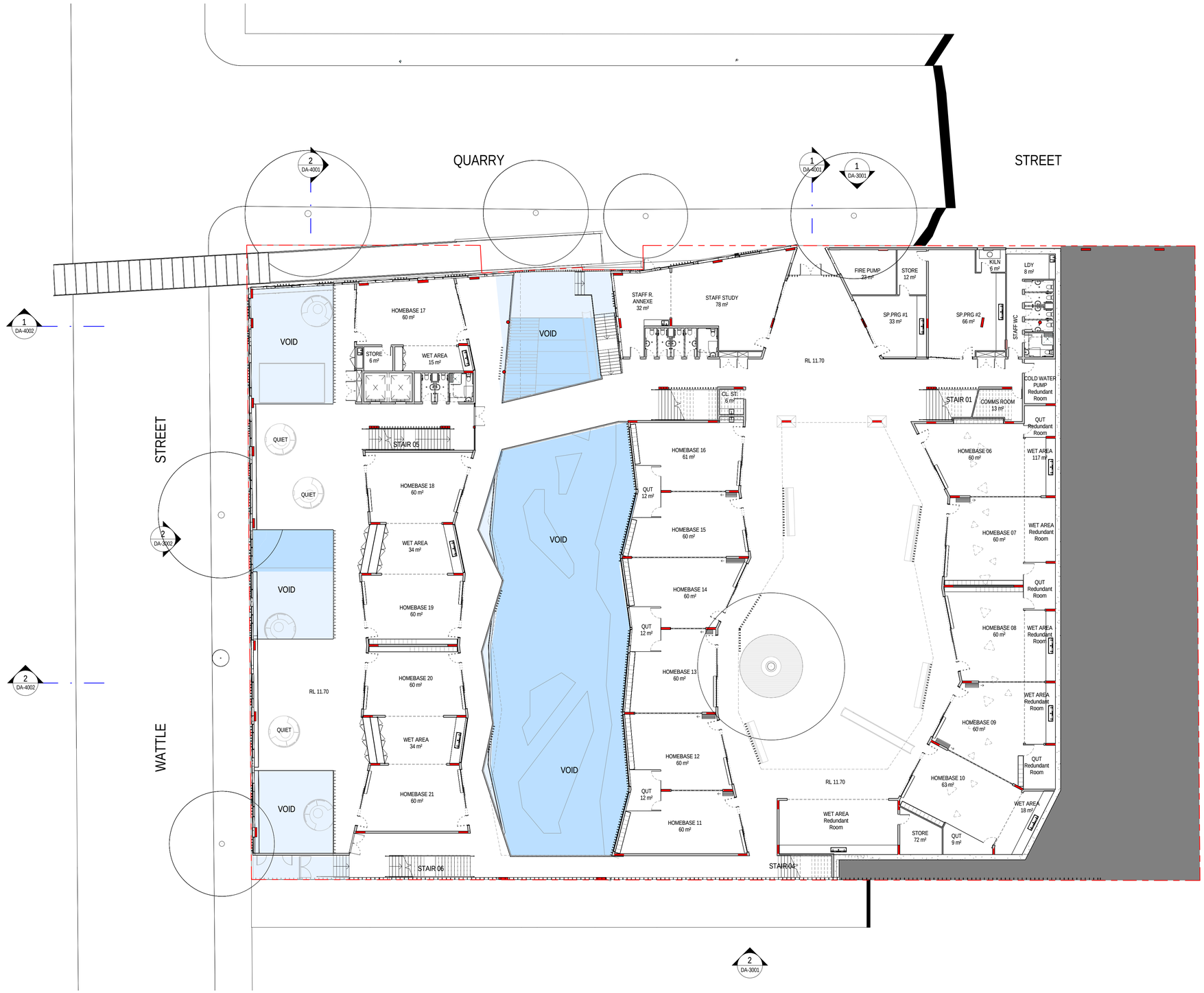

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TITLE: LEVEL 02 - MIDDLE PLAYGROUND
GENERAL ARRANGEMENT PLAN - RL 11.70

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PLOT DATE	24/06/16
PROJECT N°.	S15124
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DRAWING N°.	DA-2303

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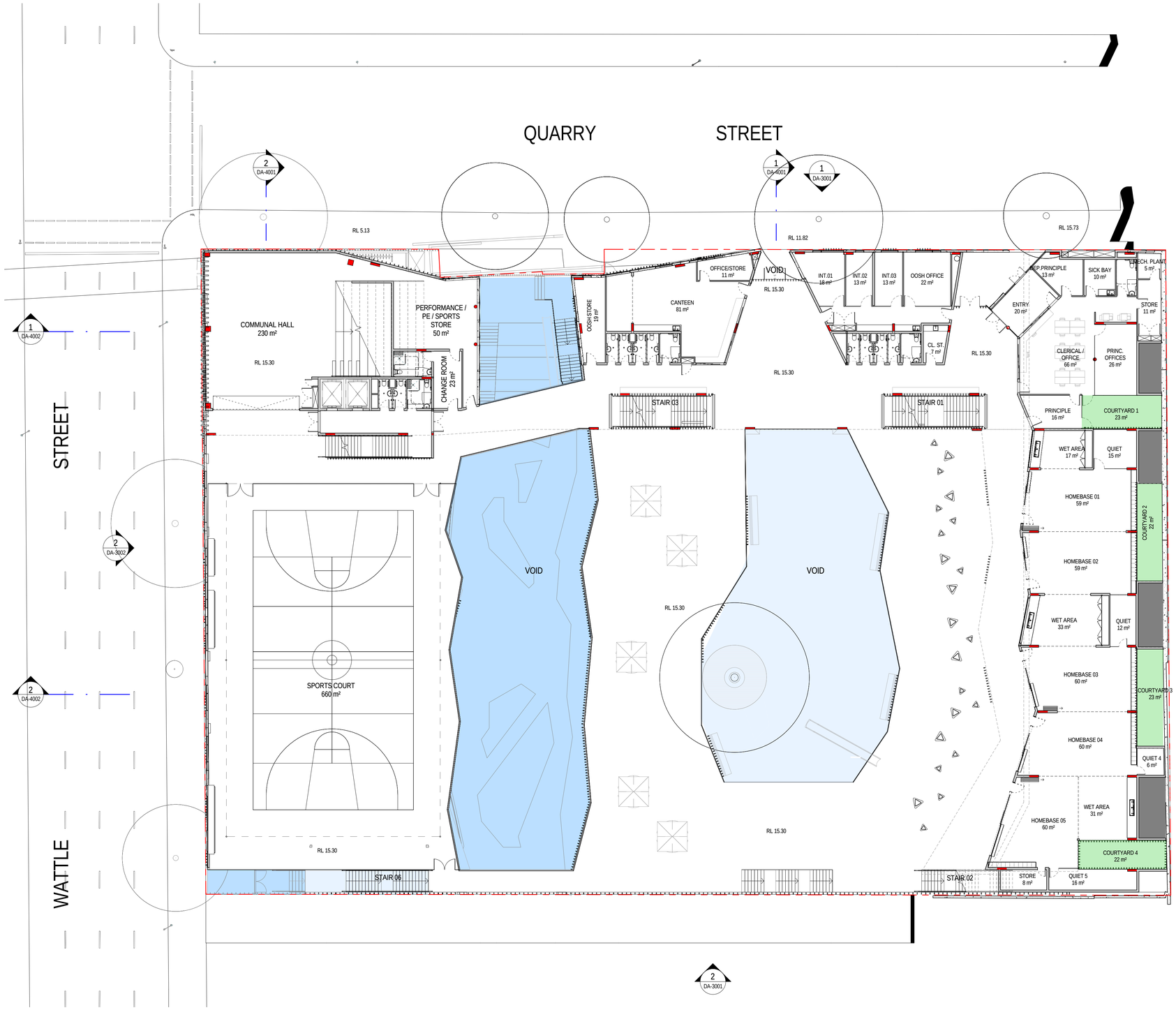

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PO BOX 651 NORTH SYDNEY NSW 2059 AUSTRALIA
T +612 8905 7100 F +612 8905 7199
E sydney@sydney.designinc.com.au
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TITLE: LEVEL 03 - UPPER PLAYGROUND
GENERAL ARRANGEMENT PLAN - RL 16.30

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QUARRY

STREET

STREET

STREET

WATTLE

JONES

GARDENS

ENTRY
69 m²
RL 18.90

COLA.
512 m²

RL 18.90

SOUND +
CHAIR STORE
19 m²

STAIR 03

STAIR 01

VOID

PRE SCHOOL
PLAY R.
58 m²

WC
14 m²

CRAFT
13 m²

VOID

TODDLER
PLAY R.
37 m²

PANTRY
5 m²

STORE
5 m²

KITCHEN
12 m²

VOID

DINING ROOM
20 m²

RL 18.90
EXTERNAL
PLAY AREA
280 m²

STAFF
12 m²

STAFF
9 m²

STAFF
18 m²

REC
15 m²

INFANT PLAY
R.
40 m²

COTS
14 m²

NAP CH
9 m²

PRAMS
9 m²

VOID

VOID

VOID

RL 15.30

STAIR 02

1 DA-4001

2 DA-4001

1 DA-3001

1 DA-4002

2 DA-3002

2 DA-4002

1 DA-3002

2 DA-3001

0 2 4 6 8 10 m

SCALE BAR - 1:200

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AUSTRALIA
PO BOX 651 NORTH SYDNEY NSW 2059
AUSTRALIA
T +612 8905 7100 F +612 8905 7199
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TITLE: LEVEL 04 - COLA

GENERAL ARRANGEMENT PLAN - RL 18.90

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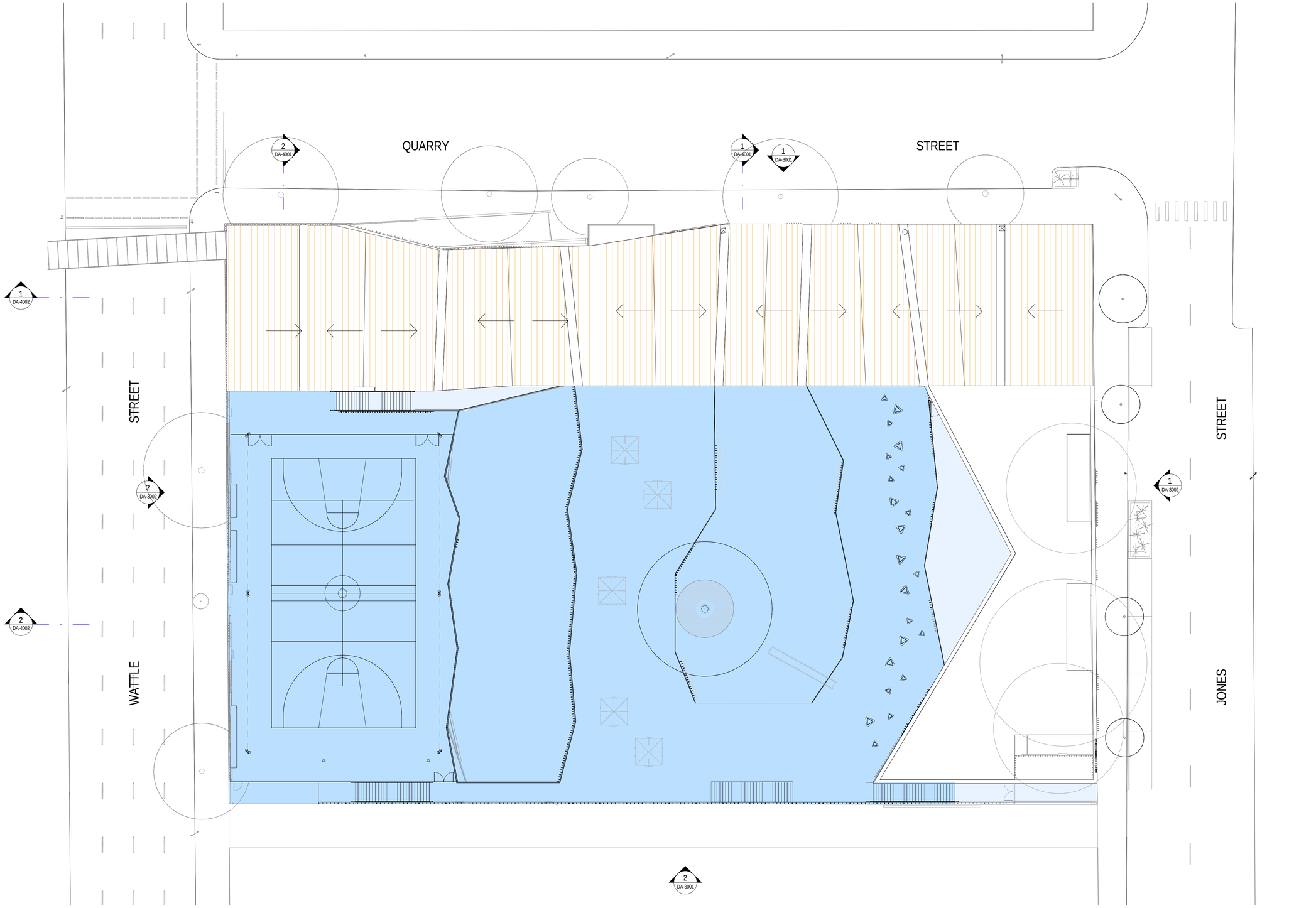

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AUSTRALIA
PO BOX 651 NORTH SYDNEY NSW 2059
AUSTRALIA
T +612 8905 7100 F +612 8905 7199
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Quarry St, Ultimo NSW

TITLE: ROOF LEVEL

GENERAL ARRANGEMENT PLAN

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PLOT DATE	24/06/16
PROJECT N°.	S15124
REVISION	1
DRAWING N°.	DA-2306

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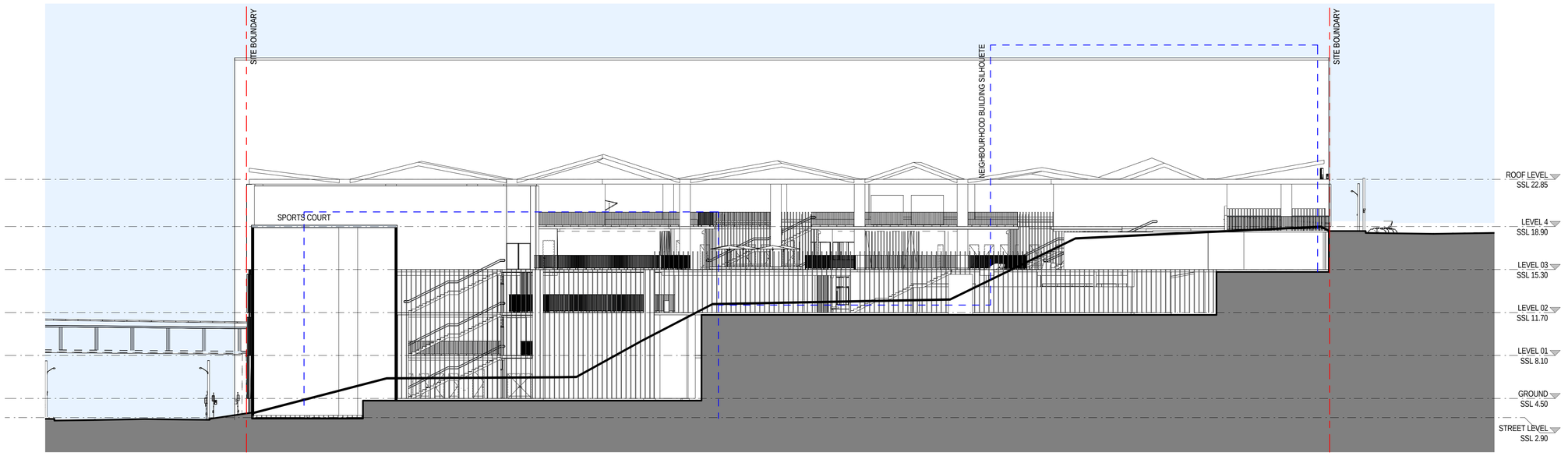
AR-2301 SCALE 1 : 200



2 SOUTH ELEVATION - NEIGHBOURHOOD
AR-2301 SCALE 1 : 200

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DesignInc Sydney PTY LIMITED ACN 003008820
L12 / 77 PACIFIC HWY NORTH SYDNEY NSW 2060
AUSTRALIA
PO BOX 651 NORTH SYDNEY NSW 2059
AUSTRALIA
T +612 8905 7100 F +612 8905 7199
E sydney@sydney.designinc.com.au
www.designinc.com.au
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TITLE: NORTH + SOUTH ELEVATIONS

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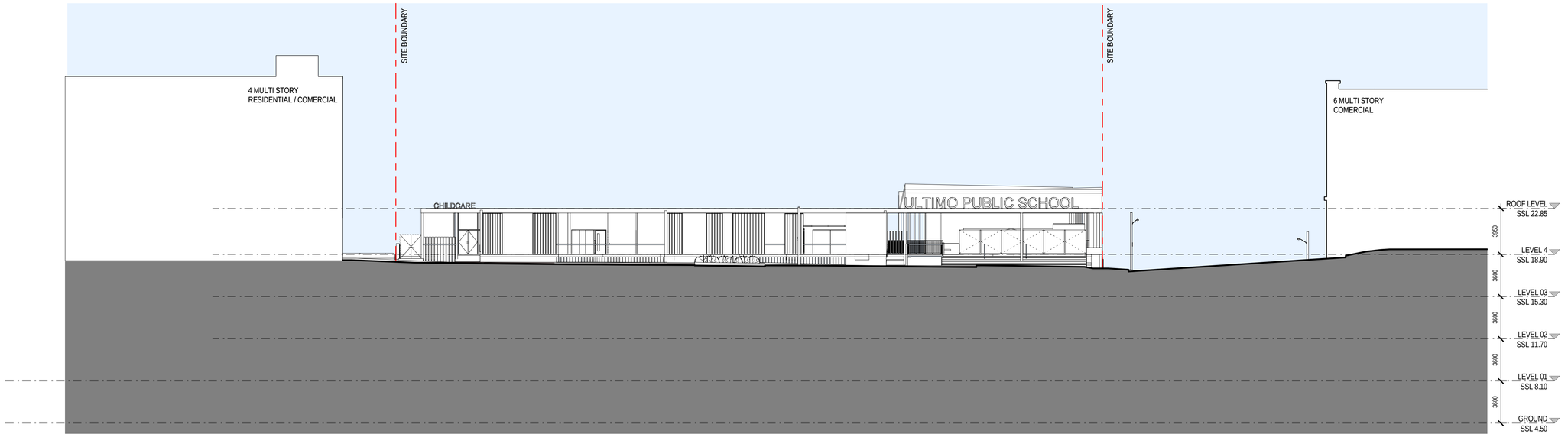
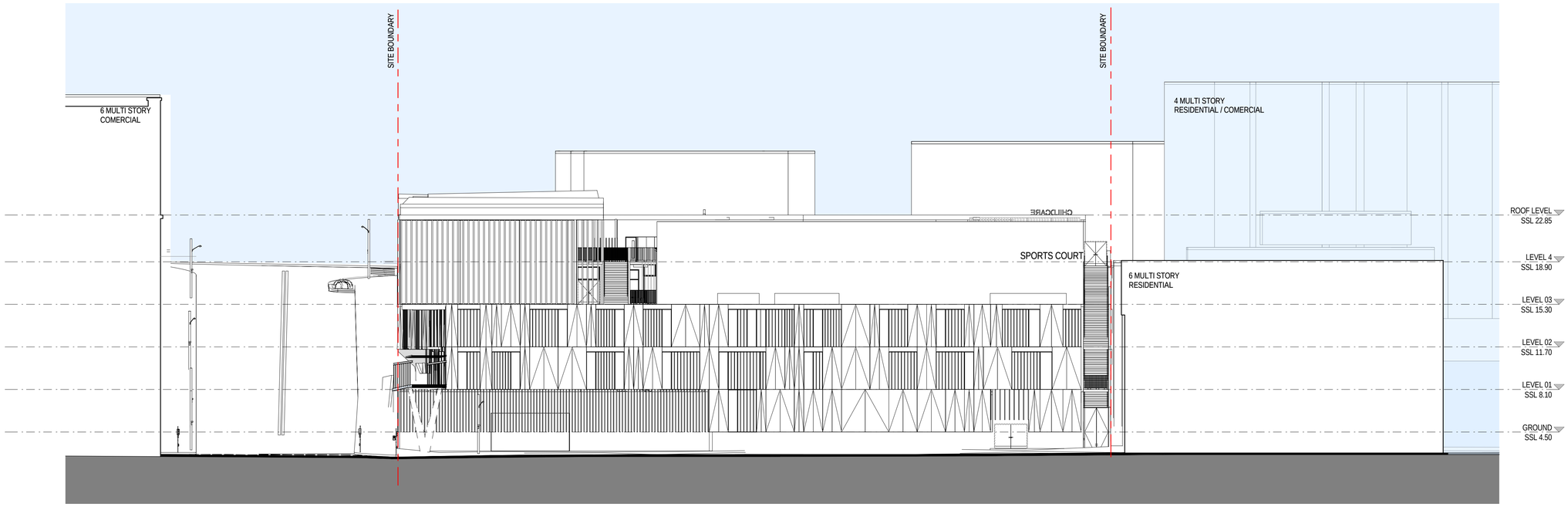


EAST ELEVATION - JONES STREET Copy 1



2 WEST ELEVATION - WATTLE STREET
AR-2301 SCALE 1 : 200

0 2 4 6 8 10 m
SCALE BAR - 1:200

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NOMINATED ARCHITECTS:
Ghislain Coulon 4669 · Anthony Quan 5421 · Sandeep Amin 7337

No	DATE	REVISIONS	BY

ARCHITECTS IN ASSOCIATION
DesignInc | Lacoste +Stevenson | bmc2
DesignInc Sydney PTY LIMITED ACN 003008820
L12 / 77 PACIFIC HWY NORTH SYDNEY NSW 2060
AUSTRALIA
PO BOX 651 NORTH SYDNEY NSW 2059
AUSTRALIA
T +612 8905 7100 F +612 8905 7199
E sydney@sydney.designinc.com.au
www.designinc.com.au
Architecture Urban Design Interiors

CLIENT: DEPARTMENT OF EDUCATION

PROJECT: ULTIMO PYRMONT PUBLIC SCHOOL REDEVELOPMENT
Quarry St, Ultimo NSW

TITLE: EAST + WEST ELEVATIONS

DRAWN BY	TB
SCALES	1 : 200 @ A1
PLOT DATE	02/03/17
PROJECT N°.	S15124
DRAWING N°.	DA-3002
REVISION	

DRAWING STATUS	REVIEWED BY	SIGNATURE	DATE
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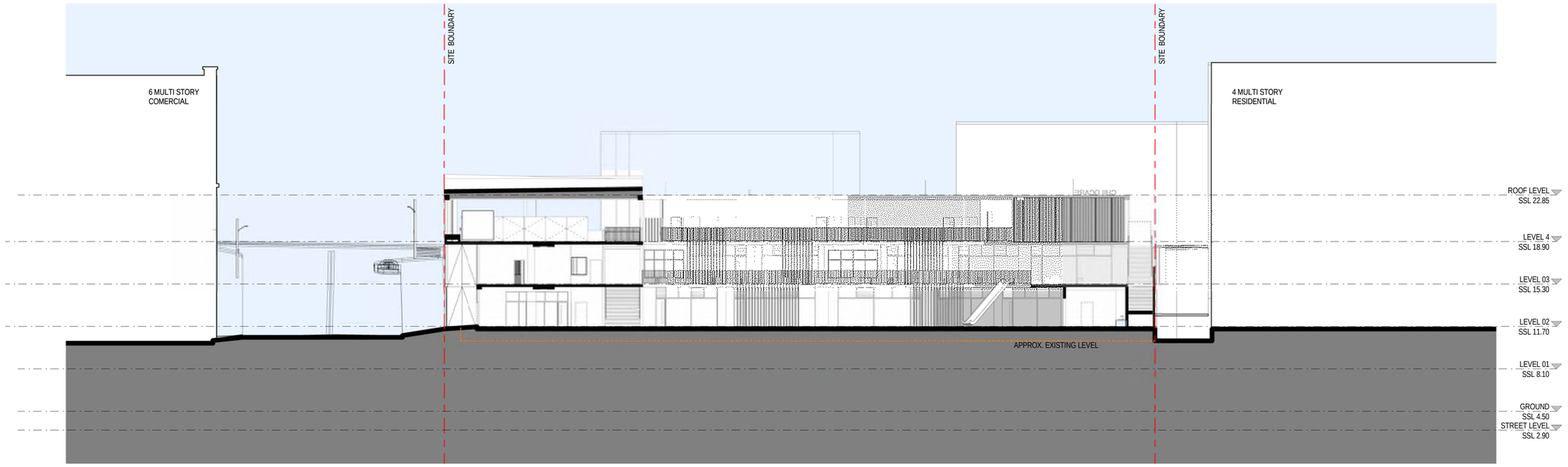
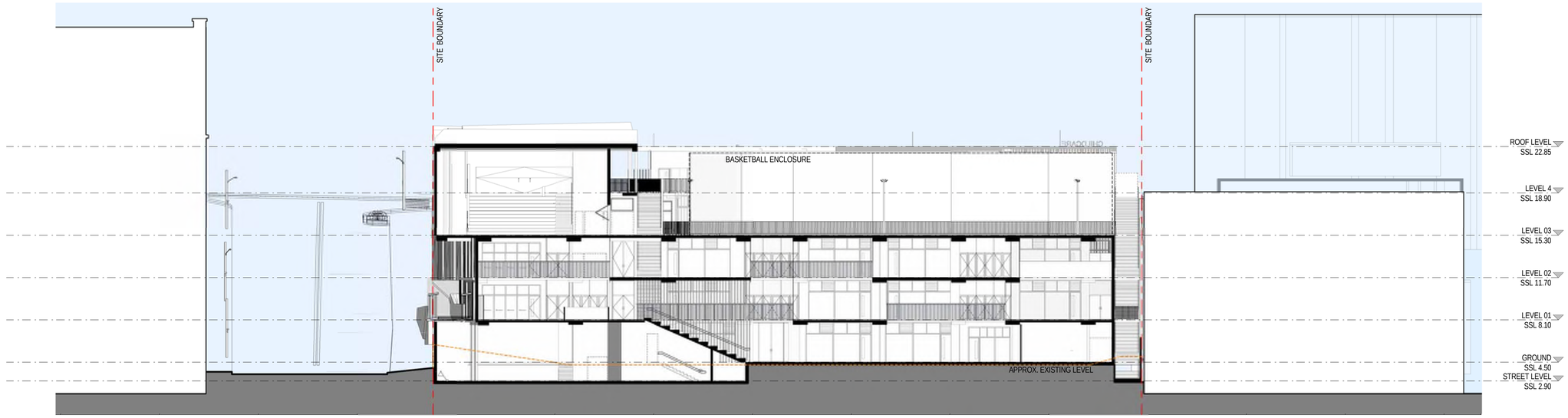


1 AR-2301 SECTION THROUGH PLAYGROUNDS
SCALE 1 : 200



2 AR-2301 SECTION THROUGH LIBRARY
SCALE 1 : 200

0 2 4 6 8 10 m
SCALE BAR - 1:200

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NOMINATED ARCHITECTS:
Ghislain Coulon 4669 · Anthony Quan 5421 · Sandeep Amin 7337

No	DATE	REVISIONS	BY
1	16.12.16	TECHINCAL STAKEHOLDERS REVIEW	BD

ARCHITECTS IN ASSOCIATION
DesignInc | Lacoste +Stevenson | bmc2

DesignInc Sydney PTY LIMITED ACN 003008820
L12 / 77 PACIFIC HWY NORTH SYDNEY NSW 2060
AUSTRALIA
PO BOX 651 NORTH SYDNEY NSW 2059
AUSTRALIA
T +612 8905 7100 F +612 8905 7199
E sydney@sydney.designinc.com.au
www.designinc.com.au
Architecture Urban Design Interiors

CLIENT: DEPARTMENT OF EDUCATION

PROJECT: ULTIMO PYRMONT PUBLIC SCHOOL REDEVELOPMENT

Quarry St, Ultimo NSW

TITLE: BUILDING SECTIONS

BUILDING SECTIONS

DRAWN BY	TB
SCALES	1 : 200 @ A1
PLOT DATE	14/06/16
PROJECT N°.	S15124
REVISION	1
DRAWING N°.	DA-4001

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DA	BD		

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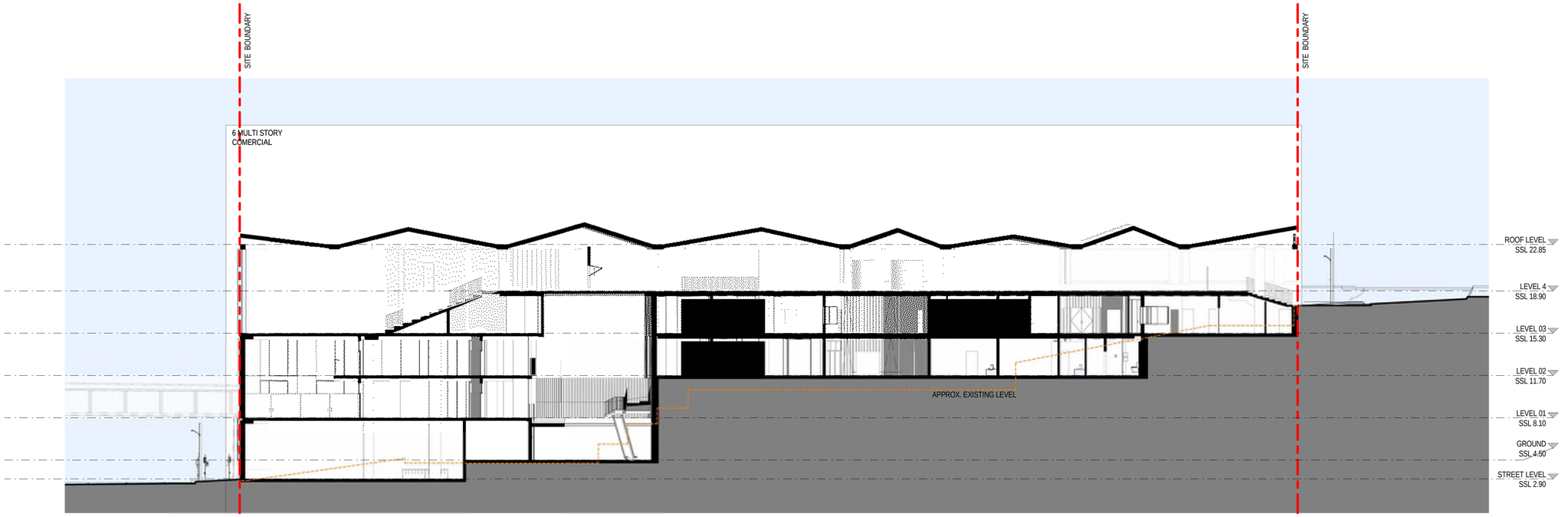
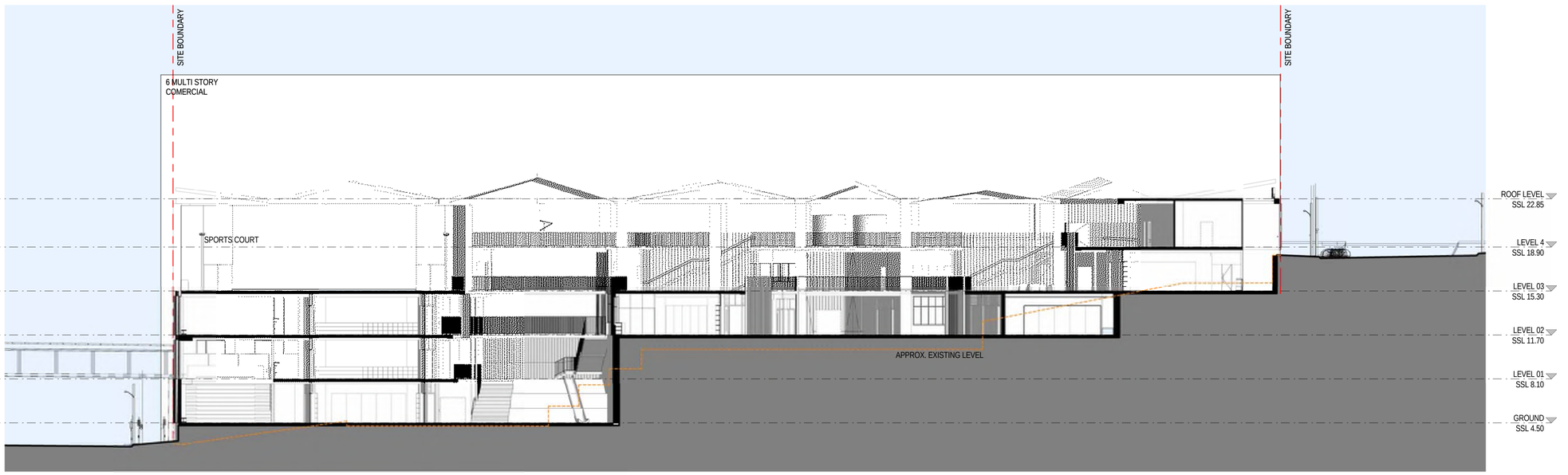


1 SECTION THROUGH COLA
AR-2301 SCALE 1 : 200



2 SECTION THROUGH PLAGROUNDS
AR-2301 SCALE 1 : 200

0 2 4 6 8 10 m
SCALE BAR - 1:200

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NOMINATED ARCHITECTS:
Ghislain Coulon 4669 · Anthony Quan 5421 · Sandeep Amin 7337

No	DATE	REVISIONS	BY

ARCHITECTS IN ASSOCIATION
DesignInc | Lacoste +Stevenson | bmc2

DesignInc Sydney PTY LIMITED ACN 003008820
L12 / 77 PACIFIC HWY NORTH SYDNEY NSW 2060
AUSTRALIA
PO BOX 651 NORTH SYDNEY NSW 2059
AUSTRALIA
T +612 8905 7100 F +612 8905 7199
E sydney@sydney.designinc.com.au
www.designinc.com.au
Architecture Urban Design Interiors

CLIENT: DEPARTMENT OF EDUCATION

PROJECT: ULTIMO PYRMONT PUBLIC SCHOOL REDEVELOPMENT

Quarry St, Ultimo NSW

TITLE: BUILDING SECTIONS

DRAWN BY	TB
SCALES	1 : 200 @ A1
PLOT DATE	01/06/17
PROJECT N°.	S15124
REVISION	
DRAWING N°.	DA-4002

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Appendix B: Borehole Logs

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 101
1 / 2

BOREHOLE LOG

Client: DESIGNINC SYDNEY PTY LTD
Project: NEW ULTIMO PYRMONT PUBLIC SCHOOL
Location: ULTIMO PUBLIC SCHOOL, QUARRY ROAD, ULTIMO, NSW

Job No.: 30361SB2 **Method:** SPIRAL AUGER **R.L. Surface:** ~16.7 m
Date: 3/5/18 **Datum:** AHD
Plant Type: JK308 **Logged/Checked By:** T.C./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION OF AUGERING	■									FILL: Silty sand, fine to coarse grained. grey brown, with fine to medium grained sandstone gravel.	M			
	■			■	N = 43 8,21,22	16	1			FILL: Gravelly sand, fine to coarse grained, fine to medium grained sandstone gravel, dark grey and brown, with concrete fragments.				APPEARS WELL COMPACTED
	■			■	N = 7 3,3,4	15	2			FILL: Gravelly sand, fine to coarse grained, fine to medium grained sandstone gravel, grey brown, with brick fragments.				APPEARS MODERATELY COMPACTED
	■			■	N > 10 4,10/ 50mm REFUSAL	14	3		-	Extremely Weathered sandstone: clayey sand, fine to coarse grained, orange brown.	XW	(D)		
						13	4			REFER TO CORED BOREHOLE LOG				HIGH 'TC' BIT RESISTANCE
						12	5							
						11	6							
						10								

JK 9.01.2 LIB:GLB Log JK AUGERHOLE - MASTER 30361SB2 ULTIMO.GPJ <<DrawingFile>> 29/05/2018 16:48 10.0.000 Datgel Lab and In Situ Tool - DGD | Lib: JK 9.01.2 2018-04-02 Prj: JK 9.01.0 2018-03-20

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 101
2 / 2

CORED BOREHOLE LOG

Client: DESIGNINC SYDNEY PTY LTD
Project: NEW ULTIMO PYRMONT PUBLIC SCHOOL
Location: ULTIMO PUBLIC SCHOOL, QUARRY ROAD, ULTIMO, NSW

Job No.: 30361SB2 **Core Size:** NMLC **R.L. Surface:** ~16.7 m
Date: 3/5/18 **Inclination:** VERTICAL **Datum:** AHD
Plant Type: JK308 **Bearing:** N/A **Logged/Checked By:** T.C./D.B.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION: Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT DETAILS: SPACING (mm) (600, 200, 60, 20)	DEFECT DETAILS: DESCRIPTION (Specific / General)	Formation
					START CORING AT 3.50m						
100% RETURN		13	4		Extremely Weathered sandstone: clayey sand, fine to coarse grained, orange brown.	XW	D	1.2			Hawkesbury Sandstone
					SANDSTONE: fine to medium grained, grey and orange brown.	MW	H	1.3		(3.76m) XWS, 0°, 20 mm.t	
								1.6			
		12	5			SW		2.0		(4.56m) XWS, 0°, 60 mm.t (4.73m) Be, 10°, P, S, Fe Sn	
								1.8			
		11	6					1.4			
								2.1			
		10	7		END OF BOREHOLE AT 6.45 m						
		9	8								
		8	9								
		7									

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No.
102
1 / 2

BOREHOLE LOG

Client: DESIGNINC SYDNEY PTY LTD
Project: NEW ULTIMO PYRMONT PUBLIC SCHOOL
Location: ULTIMO PUBLIC SCHOOL, QUARRY ROAD, ULTIMO, NSW

Job No.: 30361SB2 **Method:** SPIRAL AUGER **R.L. Surface:** ~10.5 m
Date: 3/5/18 **Datum:** AHD
Plant Type: JK308 **Logged/Checked By:** T.C./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION OF AUGERING	■					10				FILL: Silty sand, fine to medium grained, grey brown, with fine to coarse gained sandstone gravel.	M			APPEARS WELL COMPACTED
	■			■	N = 17 4,7,10		1							
						9				FILL: Gravelly sand, fine to coarse grained, brown and red brown, fine to coarse grained sandstone gravel, with brick and concrete fragments.				APPEARS POORLY COMPACTED
	■			■	N = 7 3,2,5		2							
						8								
	■			■	N = 7 2,2,5		3							
						7								
							4		-	SANDSTONE: fine grained, orange brown.	HW	L - M		MODERATE TO HIGH 'TC'BIT RESISTANCE
										REFER TO CORED BOREHOLE LOG				
						6								
							5							
						5								
							6							
						4								

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Borehole No. 102
2 / 2

CORED BOREHOLE LOG

Client: DESIGNINC SYDNEY PTY LTD
Project: NEW ULTIMO PYRMONT PUBLIC SCHOOL
Location: ULTIMO PUBLIC SCHOOL, QUARRY ROAD, ULTIMO, NSW

Job No.: 30361SB2 **Core Size:** NMLC **R.L. Surface:** ~10.5 m
Date: 3/5/18 **Inclination:** VERTICAL **Datum:** AHD
Plant Type: JK308 **Bearing:** N/A **Logged/Checked By:** T.C./D.B.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components)	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT DETAILS: SPACING (mm) (600, 200, 60, 20)	DEFECT DETAILS: DESCRIPTION (Specific / General)	Formation
		7	4		START CORING AT 4.00m						
100% RETURN		6	5		SANDSTONE: fine to medium grained, orange brown.	SW	M	0.20, 0.40		(4.06m) XWS, 10°, 10 mm.t (4.20m) XWS, 10°, 10 mm.t (4.50m) XWS, 5°, 5 mm.t	Hawkesbury Sandstone
		5	6		SANDSTONE: fine to medium grained, grey and orange brown, thinly laminated at 10-20°.			0.20, 0.30, 0.60, 0.60		(5.00m) Be, 5°, P, R, Fe Sn	
		4	7		END OF BOREHOLE AT 7.00 m						
		3	8								
		2	9								
		1									

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Borehole No. 103
1 / 2

BOREHOLE LOG

Client: DESIGNINC SYDNEY PTY LTD
Project: NEW ULTIMO PYRMONT PUBLIC SCHOOL
Location: ULTIMO PUBLIC SCHOOL, QUARRY ROAD, ULTIMO, NSW

Job No.: 30361SB2 **Method:** SPIRAL AUGER **R.L. Surface:** ~10.5 m
Date: 4/5/18 **Datum:** AHD
Plant Type: JK308 **Logged/Checked By:** T.C./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION OF AUGERING						10				FILL: Gravelly sand, fine to coarse grained, grey brown, medium to coarse grained sandstone gravel, with brick and concrete fragments.	M			
					N = 3 1,1,2		1			FILL: Gravelly sand, fine to medium grained, grey brown, trace of clay, with ash, brick, plastic and timber fragments.				APPEARS POORLY COMPACTED
					N = 4 1,2,2	9								
						8	2							
									-	SANDSTONE: fine to medium grained, orange brown.	MW	M - H		MODERATE TO HIGH 'TC' BIT RESISTANCE
										REFER TO CORED BOREHOLE LOG				
						7	3							
							4							
						6								
							5							
						5								
							6							
						4								

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Borehole No. 103
2 / 2

CORED BOREHOLE LOG

Client: DESIGNINC SYDNEY PTY LTD
Project: NEW ULTIMO PYRMONT PUBLIC SCHOOL
Location: ULTIMO PUBLIC SCHOOL, QUARRY ROAD, ULTIMO, NSW

Job No.: 30361SB2 **Core Size:** NMLC **R.L. Surface:** ~10.5 m
Date: 4/5/18 **Inclination:** VERTICAL **Datum:** AHD
Plant Type: JK308 **Bearing:** N/A **Logged/Checked By:** T.C./D.B.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION: Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT DETAILS: SPACING (mm) (600, 200, 60, 20)	DEFECT DETAILS: DESCRIPTION (Specific / General)	Formation
		8			START CORING AT 2.65m						
100% RETURN		7	3		NO CORE 0.05m SANDSTONE: fine to medium grained, grey, orange brown and red brown, bedded at 10-20°.	SW	M	0.20 0.50 0.30 0.60 0.60 0.80 0.80		(2.80m) XWS, 20°, 10 mm.t (3.14m) XWS, 10°, 10 mm.t (3.50m) XWS, 5°, 5 mm.t (3.85m) XWS, 5°, 60 mm.t (4.04m) Be, 5°, P, R, Cn (4.08m) XWS, 0°, 40 mm.t	Hawkesbury Sandstone
		6	4								
		5	5		as above, but fine to coarse grained.						
					END OF BOREHOLE AT 5.65 m						
		4	6								
		3	7								
		2	8								

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No.
104
1 / 2

BOREHOLE LOG

Client: DESIGNINC SYDNEY PTY LTD
Project: NEW ULTIMO PYRMONT PUBLIC SCHOOL
Location: ULTIMO PUBLIC SCHOOL, QUARRY ROAD, ULTIMO, NSW

Job No.: 30361SB2 **Method:** SPIRAL AUGER **R.L. Surface:** ~10.5 m
Date: 4/5/18 **Datum:** AHD
Plant Type: JK308 **Logged/Checked By:** T.C./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION OF AUGERING	■									FILL: Silty clay, medium to high plasticity, light brown, with brick fragments.	w<PL			
	■			■	N = 12 2,5,7	10	1			FILL: Silty clay, medium to high plasticity, grey brown and orange brown, with fine to coarse grained sandstone gravel and brick fragments.	w~PL		100 150	APPEARS MODERATELY COMPACTED
	■			■	N = 6 3,3,3	9	2			FILL: Clayey sand, medium to coarse grained, orange brown with fine to coarse grained sandstone gravel and brick fragments.	M			APPEARS POORLY COMPACTED
	■			■	N > 5 2,3,2/ 60mm REFUSAL	8	3			FILL: Clayey sand, medium to coarse grained, orange brown, red brown and grey, with fine grained sandstone gravel, brick fragments and slag.				
						7	4			REFER TO CORED BOREHOLE LOG				GROUNDWATER MONITORING WELL INSTALLED TO 6.4m. CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 3.4m TO 6.4m. CASING 0m TO 3.4m. 2mm SAND FILTER PACK 2.9m TO 6.4m. BENTONITE SEAL 2.9m TO 1.9m. BACKFILLED WITH CUTTINGS TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER.
						6	5							
						5	6							
						4								

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

Borehole No. 104
2 / 2

CORED BOREHOLE LOG

Client: DESIGNINC SYDNEY PTY LTD
Project: NEW ULTIMO PYRMONT PUBLIC SCHOOL
Location: ULTIMO PUBLIC SCHOOL, QUARRY ROAD, ULTIMO, NSW

Job No.: 30361SB2 **Core Size:** NMLC **R.L. Surface:** ~10.5 m
Date: 4/5/18 **Inclination:** VERTICAL **Datum:** AHD
Plant Type: JK308 **Bearing:** N/A **Logged/Checked By:** T.C./D.B.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION: Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT DETAILS: SPACING (mm) (600, 200, 60, 20)	DEFECT DETAILS: DESCRIPTION (Specific / General)	Formation
					START CORING AT 3.36m						
100% RETURN		7	4		SANDSTONE: fine to medium grained, grey, orange brown and red brown.	SW	M	0.50, 0.60, 0.50		(4.28m) XWS, 20°, 5 mm.t	Hawkesbury Sandstone
		6								(4.68m) XWS, 10°, 10 mm.t	
		5	5				H	1.1, 1.2		(5.03m) J, 30 - 45°, P, R, XWS FILLED, 5 mm.t	
		5								(5.59m) Be, 10°, P, R, Clay FILLED, 5 mm.t	
			6		as above, but medium to coarse grained.			1.5, 1.2			
		4			END OF BOREHOLE AT 6.40 m						
		3	7								
		2	8								
		1	9								

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Borehole No. 105
1 / 3

BOREHOLE LOG

Client: DESIGNINC SYDNEY PTY LTD
Project: NEW ULTIMO PYRMONT PUBLIC SCHOOL
Location: ULTIMO PUBLIC SCHOOL, QUARRY ROAD, ULTIMO, NSW

Job No.: 30361SB2 **Method:** SPIRAL AUGER **R.L. Surface:** ~10.5 m
Date: 7/5/18 **Datum:** AHD
Plant Type: JK308 **Logged/Checked By:** T.C./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION OF AUGERING	■			■	N = 7 2,4,3	10	0			FILL: Sandy clay, low plasticity, dark brown, with fine to coarse grained sandstone gravel and cobbles, trace of concrete and brick fragments.	w<PL			APPEARS MODERATELY COMPACTED
						9	1			FILL: Sandy clay low to medium plasticity, with medium to coarse grained ironstone gravel, trace of concrete, slag and brick fragments.	w~PL			
	■			■	N = 9 3,4,5	8	2			FILL: Clayey sand, medium to coarse grained, red brown, brown and light grey, trace of brick and slag fragments.	M			APPEARS POORLY TO MODERATELY COMPACTED
	■			■	N = 6 2,2,4	7	3							
	■			■	N = 7 3,3,4	6	4							
▶						5	5							
	■			■	N = 4 2,2,2	4	6			FILL: Sandy clay, medium plasticity, orange brown and light grey, with fine to coarse grained sandstone gravel, trace of brick fragments.	w<PL			

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Borehole No.
105
2 / 3

BOREHOLE LOG

Client: DESIGNINC SYDNEY PTY LTD
Project: NEW ULTIMO PYRMONT PUBLIC SCHOOL
Location: ULTIMO PUBLIC SCHOOL, QUARRY ROAD, ULTIMO, NSW

Job No.: 30361SB2 **Method:** SPIRAL AUGER **R.L. Surface:** ~10.5 m
Date: 7/5/18 **Datum:** AHD
Plant Type: JK308 **Logged/Checked By:** T.C./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
					N = 14 5,8,6	3 2 1 0 -1 -2 -3	8 9 10 11 12 13			FILL: Sandy clay, medium plasticity, orange brown and light grey, with fine to coarse grained sandstone gravel, trace of brick fragments. *(continued)*	w<PL			
									-	SANDSTONE: fine to medium grained, orange brown and grey.	HW	VL - L		VERY LOW TO LOW 'TC' BIT RESISTANCE
										REFER TO CORED BOREHOLE LOG				

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Borehole No. 105 3 / 3

CORED BOREHOLE LOG

Client: DESIGNINC SYDNEY PTY LTD
Project: NEW ULTIMO PYRMONT PUBLIC SCHOOL
Location: ULTIMO PUBLIC SCHOOL, QUARRY ROAD, ULTIMO, NSW

Job No.: 30361SB2 **Core Size:** NMLC **R.L. Surface:** ~10.5 m
Date: 7/5/18 **Inclination:** VERTICAL **Datum:** AHD
Plant Type: JK308 **Bearing:** N/A **Logged/Checked By:** T.C./D.B.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION: Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT DETAILS: SPACING (mm) (600, 200, 60, 20)	DEFECT DETAILS: DESCRIPTION (Specific / General)	Formation
100% RETURN					START CORING AT 12.41m						
		-2	13		SANDSTONE: fine grained, grey.	SW	M	0.40			Hawkesbury Sandstone
								0.40			
		-3						0.50			
			14					0.40		(14.04m) XWS, 10°, 190 mm.t	
		-4					L - M	0.30			
			15				M	0.60			
								0.60			
					END OF BOREHOLE AT 15.30 m						
		-5									
			16								
		-6									
			17								
		-7									
			18								
		-8									

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Borehole No. 106
1 / 2

BOREHOLE LOG

Client: DESIGNINC SYDNEY PTY LTD
Project: NEW ULTIMO PYRMONT PUBLIC SCHOOL
Location: ULTIMO PUBLIC SCHOOL, QUARRY ROAD, ULTIMO, NSW

Job No.: 30361SB2 **Method:** SPIRAL AUGER **R.L. Surface:** ~4.4 m
Date: 7/5/18 **Datum:** AHD
Plant Type: JK308 **Logged/Checked By:** T.C./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION OF AUGERING										CONCRETE: 290mmt				20mm DIA. REINFORCEMENT 90mm TOP COVER
	■			■	N = 15 6,7,8	4	1		-	FILL: Sandy clay, low plasticity, red brown and dark grey, with fine grained sandstone gravel, trace of glass fragments.	w~PL			APPEARS MODERATELY TO WELL COMPACTED
	■			■	N = 14 3,3,11	3	2			FILL: Sandy clay, low to medium plasticity, brown and dark grey, trace of igneous gravel, brick and slag fragments.				
	■			■	N = 12 3,5,7	2	3			as above, but mottled light grey orange brown.				
									-	SANDSTONE: fine to medium grained, grey and orange brown.	HW	VL - L		
						1	4			REFER TO CORED BOREHOLE LOG				GROUNDWATER MONITORING WELL INSTALLED TO 6.3m. CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 3.3m TO 6.3m. CASING 0m TO 3.3m. 2mm SAND FILTER PACK 2.8m TO 6.3m. BENTONITE SEAL 2.3m TO 3.3m. BACKFILLED WITH CUTTINGS TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER.
						0	5							
						-1	6							
						-2								

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Borehole No. 106
2 / 2

CORED BOREHOLE LOG

Client: DESIGNINC SYDNEY PTY LTD
Project: NEW ULTIMO PYRMONT PUBLIC SCHOOL
Location: ULTIMO PUBLIC SCHOOL, QUARRY ROAD, ULTIMO, NSW

Job No.: 30361SB2 **Core Size:** NMLC **R.L. Surface:** ~4.4 m
Date: 7/5/18 **Inclination:** VERTICAL **Datum:** AHD
Plant Type: JK308 **Bearing:** N/A **Logged/Checked By:** T.C./D.B.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION: Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT DETAILS: SPACING (mm) (600, 200, 60, 20)	DEFECT DETAILS: DESCRIPTION (Specific / General)	Formation
					START CORING AT 3.33m						
100% RETURN		1	4		SANDSTONE: fine to medium grained, grey and orange brown.	SW	M	0.80, 0.70, 0.80			Hawkesbury Sandstone
25% RETURN		0	5		NO CORE 0.03m SANDSTONE: fine to medium grained, grey and orange brown.	SW	H	1.2, 1.6, 1.5, 0.80			
		-1	6								
		-2	7		END OF BOREHOLE AT 6.30 m						
		-3	8								
		-4	9								
		-5									

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Borehole No. 107
1 / 2

BOREHOLE LOG

Client: DESIGNINC SYDNEY PTY LTD
Project: NEW ULTIMO PYRMONT PUBLIC SCHOOL
Location: ULTIMO PUBLIC SCHOOL, QUARRY ROAD, ULTIMO, NSW

Job No.: 30361SB2 **Method:** SPIRAL AUGER **R.L. Surface:** ~4.3 m
Date: 8/5/18 **Datum:** AHD
Plant Type: JK308 **Logged/Checked By:** T.C./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION OF AUGERING						4				CONCRETE: 320mm.t				20mm DIA. REINFORCEMENT 90mm TOP COVER
	■			■	N = 12 7,6,6		1		-	FILL: Silty clay, medium plasticity, dark brown, trace of fine grained sandstone gravel.	w~PL			APPEARS MODERATELY COMPACTED
						3				FILL: Clayey sand, fine to medium grained, dark brown and orange brown, with fine to coarse grained sandstone gravel and concrete and brick fragments.	M			
	■			■	N = 10 5,4,6					FILL: Silty sand, fine to coarse grained, yellow brown, trace of fine grained sandstone gravel.				
						2	2			FILL: Clayey sand, fine to medium grained, brown grey and red brown, with fine to medium grained sandstone gravel, and brick fragments.				
	■				N > 10 4,10/ 40mm REFUSAL		3		SM	Silty SAND: fine to medium grained, dark grey.	M	MD		ESTUARINE
						1			-	SANDSTONE: fine to medium grained, orange brown.	MW	VL - L		HIGH 'TC' BIT RESISTANCE
						0	4			REFER TO CORED BOREHOLE LOG				
						-1	5							
						-2	6							

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Borehole No. 107

CORED BOREHOLE LOG

Client: DESIGNINC SYDNEY PTY LTD
Project: NEW ULTIMO PYRMONT PUBLIC SCHOOL
Location: ULTIMO PUBLIC SCHOOL, QUARRY ROAD, ULTIMO, NSW

Job No.: 30361SB2 **Core Size:** NMLC **R.L. Surface:** ~4.3 m
Date: 8/5/18 **Inclination:** VERTICAL **Datum:** AHD
Plant Type: JK308 **Bearing:** N/A **Logged/Checked By:** T.C./D.B.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION: Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT DETAILS: SPACING (mm) (600, 200, 60, 20)	DEFECT DETAILS: DESCRIPTION (Specific / General)	Formation
					START CORING AT 3.15m						
100% RETURN		1	4		SANDSTONE: fine to medium grained, grey and orange brown.	SW	M	0.50, 0.70, 0.60, 0.80, 0.80, 1.0, 0.80		(3.80m) Be, 5°, P, R, Fe	Hawkesbury Sandstone
		0	5								
		-1	6								
		-2	7		END OF BOREHOLE AT 6.10 m						
		-3	8								
		-4	9								
		-5									

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Borehole No. 108
1 / 2

BOREHOLE LOG

Client: DESIGNINC SYDNEY PTY LTD
Project: NEW ULTIMO PYRMONT PUBLIC SCHOOL
Location: ULTIMO PUBLIC SCHOOL, QUARRY ROAD, ULTIMO, NSW

Job No.: 30361SB2 **Method:** SPIRAL AUGER **R.L. Surface:** ~4.2 m
Date: 8/5/18 **Datum:** AHD
Plant Type: JK308 **Logged/Checked By:** T.C./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION OF AUGERING						4				CONCRETE: 300mm.t				25mm DIA. REINFORCEMENT 90mm TOP COVER
	■			■	N = 11 2,5,6				-	FILL: Sandy clay, low plasticity, grey brown, fine grained sand, with medium to coarse grained sandstone gravel, brick, ash and timber fragments.	w~PL			APPEARS MODERATELY COMPACTED
						3	1			FILL: Silty sand, medium to coarse grained, red brown and grey, with clay, trace of fine to medium grained sandstone gravel.	M			
	■			■	N = 11 5,4,7									
						2	2			FILL: Sandy clay, medium plasticity, grey, orange brown and red brown, with fine to medium grained sandstone gravel.	w~PL			
	■			■	N = 7 4,3,4	1	3							
							4		CI-CH	SANDY SILTY CLAY: medium to high plasticity, dark grey, with fine grained sand.	w>PL	(VS)		ESTUARINE
	■			■	N=0 0,0,0	0			CI	SANDY CLAY: medium plasticity, grey and orange brown.	w~PL			RESIDUAL
							5							
	■			■	N = 5 5,4,1	-1			SC	CLAYEY SAND: fine to coarse grained, grey and orange brown.	M	L		
						-2	6		-	SANDSTONE: fine to medium grained, orange brown and grey.	HW	VL - L		VERY LOW TO LOW 'TC' BIT RESISTANCE

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Borehole No. 108
2 / 2

CORED BOREHOLE LOG

Client: DESIGNINC SYDNEY PTY LTD
Project: NEW ULTIMO PYRMONT PUBLIC SCHOOL
Location: ULTIMO PUBLIC SCHOOL, QUARRY ROAD, ULTIMO, NSW

Job No.: 30361SB2 **Core Size:** NMLC **R.L. Surface:** ~4.2 m
Date: 8/5/18 **Inclination:** VERTICAL **Datum:** AHD
Plant Type: JK308 **Bearing:** N/A **Logged/Checked By:** T.C./D.B.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION: Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT DETAILS: SPACING (mm) (600, 200, 60, 20)	DEFECT DETAILS: DESCRIPTION (Specific / General)	Formation
		-2			START CORING AT 6.90m						
			7		NO CORE 0.34m						
25% RETURN		-3			SANDSTONE: fine to medium grained, grey and orange brown, bedded at 10-20°.	FR	M	0.30		(7.43m) Be, 10°, P, R, Cn	Hawkesbury Sandstone
		-4	8					0.40		(7.87m) XWS, 0°, 10 mm.t	
								0.30		(8.10m) XWS, 5°, 10 mm.t	
										(8.46m) XWS, 5°, 5 mm.t	
										(8.54m) XWS, 10°, 3 mm.t	
		-5	9				M - H	1.2			
								0.90			
								1.0			
		-6	10		END OF BOREHOLE AT 9.90 m						
			11								
		-7									
			12								
		-8									

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ENVIRONMENTAL LOGS EXPLANATORY NOTES

INTRODUCTION

These notes have been provided to amplify the environmental report in regard to classification methods, field procedures and certain matters relating to the logging of soil and rock. Not all notes are necessarily relevant to all reports.

Where geotechnical borehole logs are utilised for environmental purpose, reference should also be made to the explanatory notes included in the geotechnical report. Environmental logs are not suitable for geotechnical purposes.

The ground is a product of continuing natural and man-made processes and therefore exhibits a variety of characteristics and properties which vary from place to place and can change with time. Environmental studies include gathering and assimilating limited facts about these characteristics and properties in order to understand or predict the behaviour of the ground on a particular site under certain conditions. This report may contain such facts obtained by inspection, excavation, probing, sampling, testing or other means of investigation. If so, they are directly relevant only to the ground at the place where and time when the investigation was carried out.

DESCRIPTION AND CLASSIFICATION METHODS

The methods of description and classification of soils and rocks used in this report are based on Australian Standard 1726:2017 *'Geotechnical Site Investigations'*. In general, descriptions cover the following properties – soil or rock type, colour, structure, strength or density, and inclusions. Identification and classification of soil and rock involves judgement and the Company infers accuracy only to the extent that is common in current geoenvironmental practice.

Soil types are described according to the predominating particle size and behaviour as set out in the attached soil classification table qualified by the grading of other particles present (eg. sandy clay) as set out below:

Soil Classification	Particle Size
Clay	< 0.002mm
Silt	0.002 to 0.075mm
Sand	0.075 to 2.36mm
Gravel	2.36 to 63mm
Cobbles	63 to 200mm
Boulders	> 200mm

Non-cohesive soils are classified on the basis of relative density, generally from the results of Standard Penetration Test (SPT) as below:

Relative Density	SPT 'N' Value (blows/300mm)
Very loose (VL)	< 4
Loose (L)	4 to 10
Medium dense (MD)	10 to 30
Dense (D)	30 to 50
Very Dense (VD)	> 50

Cohesive soils are classified on the basis of strength (consistency) either by use of a hand penetrometer, vane shear, laboratory testing and/or tactile engineering examination. The strength terms are defined as follows.

Classification	Unconfined Compressive Strength (kPa)	Indicative Undrained Shear Strength (kPa)
Very Soft (VS)	≤ 25	≤ 12
Soft (S)	> 25 and ≤ 50	> 12 and ≤ 25
Firm (F)	> 50 and ≤ 100	> 25 and ≤ 50
Stiff (St)	> 100 and ≤ 200	> 50 and ≤ 100
Very Stiff (VSt)	> 200 and ≤ 400	> 100 and ≤ 200
Hard (Hd)	> 400	> 200
Friable (Fr)	Strength not attainable – soil crumbles	

Rock types are classified by their geological names, together with descriptive terms regarding weathering, strength, defects, etc. Where relevant, further information regarding rock classification is given in the text of the report. In the Sydney Basin, 'shale' is used to describe fissile mudstone, with a weakness parallel to bedding. Rocks with alternating inter-laminations of different grain size (eg. siltstone/claystone and siltstone/fine grained sandstone) are referred to as 'laminite'.

INVESTIGATION METHODS

The following is a brief summary of investigation methods currently adopted by the Company and some comments on their use and application. All methods except test pits, hand auger drilling and portable Dynamic Cone Penetrometers require the use of a mechanical rig which is commonly mounted on a truck chassis or track base.

Test Pits: These are normally excavated with a backhoe or a tracked excavator, allowing close examination of the insitu soils and 'weaker' bedrock if it is safe to descend into the pit. The depth of penetration is limited to about 3m for a backhoe and up to 6m for a large excavator. Limitations of test pits are the problems associated with disturbance and difficulty of reinstatement and the consequent effects on close-by structures. Care must be taken if construction is to be carried out near test pit locations to either properly recompact the backfill during construction or to design and construct the structure so as not to be adversely affected by poorly compacted backfill at the test pit location.

Hand Auger Drilling: A borehole of 50mm to 100mm diameter is advanced by manually operated equipment. Refusal of the hand auger can occur on a variety of materials such as obstructions within any fill, tree roots, hard clay, gravel or ironstone, cobbles and boulders, and does not necessarily indicate rock level.

Continuous Spiral Flight Augers: The borehole is advanced using 75mm to 115mm diameter continuous spiral flight augers, which are withdrawn at intervals to allow sampling and insitu testing. This is a relatively economical means of drilling in clays and in sands above the water table. Samples are returned to the surface by the flights or may be collected after withdrawal of the auger flights, but they can be very disturbed and layers may become mixed. Information from the auger sampling (as distinct from specific sampling by SPTs or undisturbed samples) is of limited reliability due to mixing or softening of samples by groundwater, or uncertainties as to the original depth of the samples. Augering below the groundwater table is of even lesser reliability than augering above the water table.

Rock Augering: Use can be made of a Tungsten Carbide (TC) bit for auger drilling into rock to indicate rock quality and continuity by variation in drilling resistance and from examination of recovered rock cuttings. This method of investigation is quick and relatively inexpensive but provides only an indication of the likely rock strength and predicted values may be in error by a strength order. Where rock strengths may have a significant impact on construction feasibility or costs, then further investigation by means of cored boreholes may be warranted.

Wash Boring: The borehole is usually advanced by a rotary bit, with water being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be assessed from the cuttings, together with some information from "feel" and rate of penetration.

Mud Stabilised Drilling: Either Wash Boring or Continuous Core Drilling can use drilling mud as a circulating fluid to stabilise the borehole. The term 'mud' encompasses a range of products ranging from bentonite to polymers. The mud tends to mask the cuttings and reliable identification is only possible from intermittent intact sampling (eg. from SPT and U50 samples) or from rock coring, etc.

Continuous Core Drilling: A continuous core sample is obtained using a diamond tipped core barrel. Provided full core recovery is achieved (which is not always possible in very low strength rocks and granular soils), this technique provides a very reliable (but relatively expensive) method of investigation. In rocks, NMLC or HQ triple tube core barrels, which give a core of about 50mm and 61mm diameter, respectively, is usually used with water flush. The length of core recovered is compared to the length drilled and any length not recovered is shown as NO CORE. The location of NO CORE recovery is determined on site by the supervising engineer; where the location is uncertain, the loss is placed at the bottom of the drill run.

Standard Penetration Tests: Standard Penetration Tests (SPT) are used mainly in non-cohesive soils, but can also be used in cohesive soils, as a means of indicating density or strength and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289.6.3.1–2004 (R2016) *'Methods of Testing Soils for Engineering Purposes, Soil Strength and Consolidation Tests – Determination of the Penetration Resistance of a Soil – Standard Penetration Test (SPT)'*.

The test is carried out in a borehole by driving a 50mm diameter split sample tube with a tapered shoe, under the impact of a 63.5kg hammer with a free fall of 760mm. It is normal for the tube to be driven in three successive 150mm increments and the 'N' value is taken as the number of blows for the last 300mm. In dense sands, very hard clays or weak rock, the full 450mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form:

- In the case where full penetration is obtained with successive blow counts for each 150mm of, say, 4, 6 and 7 blows, as

  N = 13
  4, 6, 7

- In a case where the test is discontinued short of full penetration, say after 15 blows for the first 150mm and 30 blows for the next 40mm, as

  N > 30
  15, 30/40mm

The results of the test can be related empirically to the engineering properties of the soil.

A modification to the SPT is where the same driving system is used with a solid 60° tipped steel cone of the same diameter as the SPT hollow sampler. The solid cone can be continuously driven for some distance in soft clays or loose sands, or may be used where damage would otherwise occur to the SPT. The results of this Solid Cone Penetration Test (SCPT) are shown as 'N_c' on the borehole logs, together with the number of blows per 150mm penetration.

LOGS

The borehole or test pit logs presented herein are an interpretation of the subsurface conditions, and their reliability will depend to some extent on the frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will enable the most reliable assessment, but is not always practicable or possible to justify on economic grounds. In any case, the boreholes or test pits represent only a very small sample of the total subsurface conditions.

The terms and symbols used in preparation of the logs are defined in the following pages.

Interpretation of the information shown on the logs, and its application to design and construction, should therefore take into account the spacing of boreholes or test pits, the method of drilling or excavation, the frequency of sampling and testing and the possibility of other than 'straight line' variations between the boreholes or test pits. Subsurface conditions between boreholes or test pits may vary significantly from conditions encountered at the borehole or test pit locations.

GROUNDWATER

Where groundwater levels are measured in boreholes, there are several potential problems:

- Although groundwater may be present, in low permeability soils it may enter the hole slowly or perhaps not at all during the time it is left open.
- A localised perched water table may lead to an erroneous indication of the true water table.
- Water table levels will vary from time to time with seasons or recent weather changes and may not be the same at the time of construction.
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must be washed out of the hole or 'reverted' chemically if reliable water observations are to be made.

More reliable measurements can be made by installing standpipes which are read after the groundwater level has stabilised at intervals ranging from several days to perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from perched water tables or surface water.

FILL

The presence of fill materials can often be determined only by the inclusion of foreign objects (eg. bricks, steel, etc) or by distinctly unusual colour, texture or fabric. Identification of the extent of fill materials will also depend on investigation methods and frequency. Where natural soils similar to those at the site are used for fill, it may be difficult with limited testing and sampling to reliably assess the extent of the fill.

The presence of fill materials is usually regarded with caution as the possible variation in density and material type is much greater than with natural soil deposits. Consequently, there is an increased risk of adverse environmental characteristics or behaviour. If the volume and nature of fill is of importance to a project, then frequent test pit excavations are preferable to boreholes.

LABORATORY TESTING

Laboratory testing has not been undertaken to confirm the soil classification and rock strengths indicated on the environmental logs unless noted in the report.

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SYMBOL LEGENDS

SOIL

FILL

TOPSOIL

CLAY (CL, CI, CH)

SILT (ML, MH)

SAND (SP, SW)

GRAVEL (GP, GW)

SANDY CLAY (CL, CI, CH)

SILTY CLAY (CL, CI, CH)

CLAYEY SAND (SC)

SILTY SAND (SM)

GRAVELLY CLAY (CL, CI, CH)

CLAYEY GRAVEL (GC)

SANDY SILT (ML, MH)

PEAT AND HIGHLY ORGANIC SOILS (Pt)

ROCK

CONGLOMERATE

SANDSTONE

SHALE/MUDSTONE

SILTSTONE

CLAYSTONE

COAL

LAMINITE

LIMESTONE

PHYLLITE, SCHIST

TUFF

GRANITE, GABBRO

DOLERITE, DIORITE

BASALT, ANDESITE

QUARTZITE

OTHER MATERIALS

BRICKS OR PAVERS

CONCRETE

ASPHALTIC CONCRETE

CLASSIFICATION OF COARSE AND FINE GRAINED SOILS

Major Divisions		Group Symbol	Typical Names	Field Classification of Sand and Gravel	Laboratory Classification	
Coarse grained soil (more than 65% of soil excluding oversize fraction is greater than 0.075mm)	GRAVEL (more than half of coarse fraction is larger than 2.36mm	GW	Gravel and gravel-sand mixtures, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	$C_u > 4$ $1 < C_c < 3$
		GP	Gravel and gravel-sand mixtures, little or no fines, uniform gravels	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	Fails to comply with above
		GM	Gravel-silt mixtures and gravel-sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength	≥ 12% fines, fines are silty	Fines behave as silt
		GC	Gravel-clay mixtures and gravel-sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength	≥ 12% fines, fines are clayey	Fines behave as clay
	SAND (more than half of coarse fraction is smaller than 2.36mm)	SW	Sand and gravel-sand mixtures, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	$C_u > 6$ $1 < C_c < 3$
		SP	Sand and gravel-sand mixtures, little or no fines	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	Fails to comply with above
		SM	Sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength	≥ 12% fines, fines are silty	N/A
		SC	Sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength	≥ 12% fines, fines are clayey	

Major Divisions		Group Symbol	Typical Names	Field Classification of Silt and Clay			Laboratory Classification
				Dry Strength	Dilatancy	Toughness	% < 0.075mm
ine grained soils (more than 35% of soil excluding oversize fraction is less than 0.075mm)	SILT and CLAY (low to medium plasticity)	ML	Inorganic silt and very fine sand, rock flour, silty or clayey fine sand or silt with low plasticity	None to low	Slow to rapid	Low	Below A line
		CL, CI	Inorganic clay of low to medium plasticity, gravelly clay, sandy clay	Medium to high	None to slow	Medium	Above A line
		OL	Organic silt	Low to medium	Slow	Low	Below A line
	SILT and CLAY (high plasticity)	MH	Inorganic silt	Low to medium	None to slow	Low to medium	Below A line
		CH	Inorganic clay of high plasticity	High to very high	None	High	Above A line
		OH	Organic clay of medium to high plasticity, organic silt	Medium to high	None to very slow	Low to medium	Below A line
	Highly organic soil	Pt	Peat, highly organic soil	–	–	–	–

Laboratory Classification Criteria

A well graded coarse grained soil is one for which the coefficient of uniformity $Cu > 4$ and the coefficient of curvature $1 < C_c < 3$. Otherwise, the soil is poorly graded. These coefficients are given by:

$$C_u = \frac{D_{60}}{D_{10}} \quad \text{and} \quad C_c = \frac{(D_{30})^2}{D_{10}\ D_{60}}$$

Where D_{10}, D_{30} and D_{60} are those grain sizes for which 10%, 30% and 60% of the soil grains, respectively, are smaller.

NOTES:

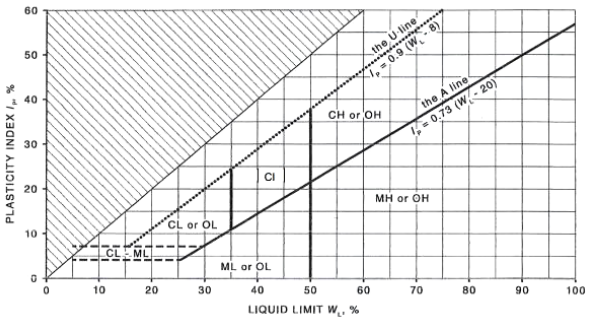
1 For a coarse grained soil with a fines content between 5% and 12%, the soil is given a dual classification comprising the two group symbols separated by a dash; for example, for a poorly graded gravel with between 5% and 12% silt fines, the classification is GP-GM.

2 Where the grading is determined from laboratory tests, it is defined by coefficients of curvature (C_c) and uniformity (C_u) derived from the particle size distribution curve.

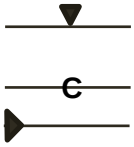
3 Clay soils with liquid limits > 35% and ≤ 50% may be classified as being of medium plasticity.

4 The U line on the Modified Casagrande Chart is an approximate upper bound for most natural soils.

Modified Casagrande Chart for Classifying Silts and Clays according to their Behaviour



LOG SYMBOLS

Log Column	Symbol	Definition
Groundwater Record		Standing water level. Time delay following completion of drilling/excavation may be shown. Extent of borehole/test pit collapse shortly after drilling/excavation. Groundwater seepage into borehole or test pit noted during drilling or excavation.
Samples	ES U50 DB DS ASB ASS SAL	Sample taken over depth indicated, for environmental analysis. Undisturbed 50mm diameter tube sample taken over depth indicated. Bulk disturbed sample taken over depth indicated. Small disturbed bag sample taken over depth indicated. Soil sample taken over depth indicated, for asbestos analysis. Soil sample taken over depth indicated, for acid sulfate soil analysis. Soil sample taken over depth indicated, for salinity analysis.
Field Tests	N = 17 4, 7, 10	Standard Penetration Test (SPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration. 'Refusal' refers to apparent hammer refusal within the corresponding 150mm depth increment.
	N_c = 5 7 3R	Solid Cone Penetration Test (SCPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration for 60° solid cone driven by SPT hammer. 'R' refers to apparent hammer refusal within the corresponding 150mm depth increment.
	VNS = 25 PID = 100	Vane shear reading in kPa of undrained shear strength. Photoionisation detector reading in ppm (soil sample headspace test).
Moisture Condition (Fine Grained Soils)	w > PL $w \approx$ PL w < PL $w \approx$ LL w > LL	Moisture content estimated to be greater than plastic limit. Moisture content estimated to be approximately equal to plastic limit. Moisture content estimated to be less than plastic limit. Moisture content estimated to be near liquid limit. Moisture content estimated to be wet of liquid limit.
(Coarse Grained Soils)	D M W	DRY – runs freely through fingers. MOIST – does not run freely but no free water visible on soil surface. WET – free water visible on soil surface.
Strength (Consistency) Cohesive Soils	VS S F St VSt Hd Fr ( )	VERY SOFT – unconfined compressive strength ≤ 25kPa. SOFT – unconfined compressive strength > 25kPa and ≤ 50kPa. FIRM – unconfined compressive strength > 50kPa and ≤ 100kPa. STIFF – unconfined compressive strength > 100kPa and ≤ 200kPa. VERY STIFF – unconfined compressive strength > 200kPa and ≤ 400kPa. HARD – unconfined compressive strength > 400kPa. FRIABLE – strength not attainable, soil crumbles. Bracketed symbol indicates estimated consistency based on tactile examination or other assessment.
Density Index/ Relative Density (Cohesionless Soils)	VL L MD D VD ( )	**Density Index (I_D) Range (%)** / **SPT 'N' Value Range (Blows/300mm)** VERY LOOSE ≤ 15 — 0 – 4 LOOSE > 15 and ≤ 35 — 4 – 10 MEDIUM DENSE > 35 and ≤ 65 — 10 – 30 DENSE > 65 and ≤ 85 — 30 – 50 VERY DENSE > 85 — > 50 Bracketed symbol indicates estimated density based on ease of drilling or other assessment.
Hand Penetrometer Readings	300 250	Measures reading in kPa of unconfined compressive strength. Numbers indicate individual test results on representative undisturbed material unless noted otherwise.

Log Column	Symbol	Definition
Remarks	'V' bit	Hardened steel 'V' shaped bit.
	'TC' bit	Twin pronged tungsten carbide bit.
	T_{60}	Penetration of auger string in mm under static load of rig applied by drill head hydraulics without rotation of augers.
	Soil Origin	The geological origin of the soil can generally be described as:
		RESIDUAL – soil formed directly from insitu weathering of the underlying rock. No visible structure or fabric of the parent rock.
		EXTREMELY WEATHERED – soil formed directly from insitu weathering of the underlying rock. Material is of soil strength but retains the structure and/or fabric of the parent rock.
		ALLUVIAL – soil deposited by creeks and rivers.
		ESTUARINE – soil deposited in coastal estuaries, including sediments caused by inflowing creeks and rivers, and tidal currents.
		MARINE – soil deposited in a marine environment.
		AEOLIAN – soil carried and deposited by wind.
		COLLUVIAL – soil and rock debris transported downslope by gravity, with or without the assistance of flowing water. Colluvium is usually a thick deposit formed from a landslide. The description 'slopewash' is used for thinner surficial deposits.
		LITTORAL – beach deposited soil.

Classification of Material Weathering

Term		Abbreviation		Definition
Residual Soil		RS		Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are no longer visible, but the soil has not been significantly transported.
Extremely Weathered		XW		Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible.
Highly Weathered	Distinctly Weathered (Note 1)	HW	DW	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is significantly changed by weathering. Some primary minerals have weathered to clay minerals. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
Moderately Weathered		MW		The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable, but shows little or no change of strength from fresh rock.
Slightly Weathered		SW		Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.
Fresh		FR		Rock shows no sign of decomposition of individual minerals or colour changes.

NOTE 1: The term 'Distinctly Weathered' is used where it is not practicable to distinguish between 'Highly Weathered' and 'Moderately Weathered' rock. 'Distinctly Weathered' is defined as follows: *'Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores'*. There is some change in rock strength.

Rock Material Strength Classification

Term	Abbreviation	Uniaxial Compressive Strength (MPa)	Guide to Strength	
			Point Load Strength Index $Is_{(50)}$ (MPa)	Field Assessment
Very Low Strength	VL	0.6 to 2	0.03 to 0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 30mm thick can be broken by finger pressure.
Low Strength	L	2 to 6	0.1 to 0.3	Easily scored with a knife; indentations 1mm to 3mm show in the specimen with firm blows of the pick point; has dull sound under hammer. A piece of core 150mm long by 50mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
Medium Strength	M	6 to 20	0.3 to 1	Scored with a knife; a piece of core 150mm long by 50mm diameter can be broken by hand with difficulty.
High Strength	H	20 to 60	1 to 3	A piece of core 150mm long by 50mm diameter cannot be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
Very High Strength	VH	60 to 200	3 to 10	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
Extremely High Strength	EH	> 200	> 10	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

Appendix C: Laboratory Reports & COC Documents

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 191242

Client Details

Client	Environmental Investigation Services
Attention	Todd Hore
Address	PO Box 976, North Ryde BC, NSW, 1670

Sample Details

Your Reference	**E30361KH, Ultimo**
Number of Samples	40 soil
Date samples received	10/05/2018
Date completed instructions received	10/05/2018

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	17/05/2018
Date of Issue	17/05/2018

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Asbestos Approved By
Analysed by Asbestos Approved Identifier: Lucy Zhu
Authorised by Asbestos Approved Signatory: Matt Tang

Results Approved By
Dragana Tomas, Senior Chemist
Jeremy Faircloth, Organics Supervisor
Ken Nguyen, Senior Chemist
Matthew Tang, Asbsestos Analyst
Nick Sarlamis, Inorganics Supervisor

Authorised By

Jacinta Hurst, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		191242-1	191242-2	191242-3	191242-4	191242-6
Your Reference	UNITS	BH101	BH101	BH101	BH102	BH102
Depth		0-0.2	0.5-0.95	1.5-1.95	0.5-0.95	3-3.45
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Date analysed	-	14/05/2018	14/05/2018	14/05/2018	14/05/2018	14/05/2018
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	92	99	98	96	97

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		191242-7	191242-8	191242-9	191242-11	191242-12
Your Reference	UNITS	BH103	BH103	BH103	BH104	BH104
Depth		0-0.2	0.5-0.95	1.5-1.95	0.5-0.95	1.5-1.95
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Date analysed	-	14/05/2018	14/05/2018	14/05/2018	14/05/2018	14/05/2018
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	92	91	99	94	92

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		191242-13	191242-14	191242-15	191242-17	191242-19
Your Reference	UNITS	BH104	BH105	BH105	BH105	BH106
Depth		3-3.45	0.5-0.95	1.5-1.95	4.5-4.95	0.5-0.95
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Date analysed	-	14/05/2018	14/05/2018	14/05/2018	14/05/2018	14/05/2018
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	89	97	91	96	98

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		191242-20	191242-21	191242-22	191242-23	191242-24
Your Reference	UNITS	BH106	BH106	BH107	BH107	BH107
Depth		1.5-1.95	2.7-3.15	0.5-0.95	1.5-1.95	2.7-2.9
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Date analysed	-	14/05/2018	14/05/2018	14/05/2018	14/05/2018	14/05/2018
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	94	90	97	90	92

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		191242-25	191242-26	191242-27	191242-28	191242-29
Your Reference	UNITS	BH108	BH108	BH108	DUP1	DUP2
Depth		0.5-0.95	1.5-1.95	4.2-4.65	-	-
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Date analysed	-	14/05/2018	14/05/2018	14/05/2018	14/05/2018	14/05/2018
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	92	92	90	96	101

vTRH(C6-C10)/BTEXN in Soil				
Our Reference		191242-30	191242-31	191242-40
Your Reference	UNITS	DUP3	TB1	BH102
Depth		-	-	0-0.2
Date Sampled		03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil
Date extracted	-	11/05/2018	11/05/2018	11/05/2018
Date analysed	-	14/05/2018	14/05/2018	14/05/2018
TRH C_6 - C_9	mg/kg	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	93	98	103

svTRH (C10-C40) in Soil						
Our Reference		191242-1	191242-2	191242-3	191242-4	191242-6
Your Reference	UNITS	BH101	BH101	BH101	BH102	BH102
Depth		0-0.2	0.5-0.95	1.5-1.95	0.5-0.95	3-3.45
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Date analysed	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	140	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	120	180	<100	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	140	290	180	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	140	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	140	420	180	<50	<50
Surrogate o-Terphenyl	%	100	82	78	77	76

svTRH (C10-C40) in Soil						
Our Reference		191242-7	191242-8	191242-9	191242-11	191242-12
Your Reference	UNITS	BH103	BH103	BH103	BH104	BH104
Depth		0-0.2	0.5-0.95	1.5-1.95	0.5-0.95	1.5-1.95
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Date analysed	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	76	76	76	76	76

svTRH (C10-C40) in Soil						
Our Reference		191242-13	191242-14	191242-15	191242-17	191242-19
Your Reference	UNITS	BH104	BH105	BH105	BH105	BH106
Depth		3-3.45	0.5-0.95	1.5-1.95	4.5-4.95	0.5-0.95
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Date analysed	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	150	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	100	<100	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	240	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	240	<50	<50	<50
Surrogate o-Terphenyl	%	76	78	76	75	78

svTRH (C10-C40) in Soil						
Our Reference		191242-20	191242-21	191242-22	191242-23	191242-24
Your Reference	UNITS	BH106	BH106	BH107	BH107	BH107
Depth		1.5-1.95	2.7-3.15	0.5-0.95	1.5-1.95	2.7-2.9
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Date analysed	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	12/05/2018
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	76	75	78	73	72

svTRH (C10-C40) in Soil						
Our Reference		191242-25	191242-26	191242-27	191242-28	191242-29
Your Reference	UNITS	BH108	BH108	BH108	DUP1	DUP2
Depth		0.5-0.95	1.5-1.95	4.2-4.65	-	-
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Date analysed	-	12/05/2018	12/05/2018	12/05/2018	12/05/2018	12/05/2018
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	75	74	72	77	76

svTRH (C10-C40) in Soil			
Our Reference		191242-30	191242-40
Your Reference	UNITS	DUP3	BH102
Depth		-	0-0.2
Date Sampled		03/05/2018	03/05/2018
Type of sample		soil	soil
Date extracted	-	11/05/2018	11/05/2018
Date analysed	-	12/05/2018	12/05/2018
TRH C_{10} - C_{14}	mg/kg	<50	<50
TRH C_{15} - C_{28}	mg/kg	160	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50
TRH >C_{16} -C_{34}	mg/kg	230	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	230	<50
Surrogate o-Terphenyl	%	80	78

PAHs in Soil						
Our Reference		191242-1	191242-2	191242-3	191242-4	191242-6
Your Reference	UNITS	BH101	BH101	BH101	BH102	BH102
Depth		0-0.2	0.5-0.95	1.5-1.95	0.5-0.95	3-3.45
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Date analysed	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Naphthalene	mg/kg	<0.1	<0.1	0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	0.7	0.8	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	2.8	2.2	<0.1	0.2
Anthracene	mg/kg	<0.1	0.8	0.7	<0.1	<0.1
Fluoranthene	mg/kg	0.2	6.8	5.4	0.1	0.6
Pyrene	mg/kg	0.2	7.4	5.6	0.1	0.6
Benzo(a)anthracene	mg/kg	<0.1	4.0	3.7	<0.1	0.4
Chrysene	mg/kg	0.1	3.7	3.1	<0.1	0.3
Benzo(b,j+k)fluoranthene	mg/kg	0.2	6.5	5.9	<0.2	0.6
Benzo(a)pyrene	mg/kg	0.1	4.4	3.8	0.06	0.3
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	2.2	1.9	<0.1	0.2
Dibenzo(a,h)anthracene	mg/kg	<0.1	0.7	0.6	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	2.9	2.5	<0.1	0.2
Total +ve PAH's	mg/kg	0.82	43	36	0.3	3.5
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	6.4	5.7	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	6.4	5.7	<0.5	0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	6.4	5.7	<0.5	0.6
Surrogate p-Terphenyl-d14	%	102	99	98	101	97

PAHs in Soil						
Our Reference		191242-7	191242-8	191242-9	191242-11	191242-12
Your Reference	UNITS	BH103	BH103	BH103	BH104	BH104
Depth		0-0.2	0.5-0.95	1.5-1.95	0.5-0.95	1.5-1.95
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Date analysed	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.3	0.4	0.3	<0.1	0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.8	0.9	0.6	<0.1	0.3
Pyrene	mg/kg	0.9	0.9	0.6	0.1	0.4
Benzo(a)anthracene	mg/kg	0.5	0.5	0.3	<0.1	0.2
Chrysene	mg/kg	0.5	0.5	0.3	<0.1	0.2
Benzo(b,j+k)fluoranthene	mg/kg	0.9	0.8	0.5	<0.2	0.3
Benzo(a)pyrene	mg/kg	0.52	0.5	0.3	0.05	0.2
Indeno(1,2,3-c,d)pyrene	mg/kg	0.3	0.2	0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.4	0.3	0.2	<0.1	0.1
Total +ve PAH's	mg/kg	5.0	5.0	3.3	0.2	1.8
Benzo(a)pyrene TEQ calc (zero)	mg/kg	0.7	0.6	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	0.7	0.7	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	0.8	0.7	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	98	98	98	101	100

PAHs in Soil						
Our Reference		191242-13	191242-14	191242-15	191242-17	191242-19
Your Reference	UNITS	BH104	BH105	BH105	BH105	BH106
Depth		3-3.45	0.5-0.95	1.5-1.95	4.5-4.95	0.5-0.95
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Date analysed	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Naphthalene	mg/kg	<0.1	0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	0.1	0.8	0.2	<0.1	0.5
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	0.1	<0.1	<0.1	0.1
Phenanthrene	mg/kg	0.6	2.6	0.8	<0.1	3.8
Anthracene	mg/kg	0.1	1.0	0.1	<0.1	0.9
Fluoranthene	mg/kg	1.5	9.2	1.7	<0.1	5.3
Pyrene	mg/kg	1.5	11	1.8	<0.1	5.4
Benzo(a)anthracene	mg/kg	0.9	6.8	1.0	<0.1	2.8
Chrysene	mg/kg	0.7	5.2	1	<0.1	2.6
Benzo(b,j+k)fluoranthene	mg/kg	1	8.9	2	<0.2	4.4
Benzo(a)pyrene	mg/kg	0.84	5.9	1.0	<0.05	2.7
Indeno(1,2,3-c,d)pyrene	mg/kg	0.4	2.5	0.4	<0.1	1.3
Dibenzo(a,h)anthracene	mg/kg	<0.1	0.8	0.1	<0.1	0.4
Benzo(g,h,i)perylene	mg/kg	0.5	3.1	0.6	<0.1	1.5
Total +ve PAH's	mg/kg	8.4	58	10	<0.05	32
Benzo(a)pyrene TEQ calc (zero)	mg/kg	1.1	8.6	1.4	<0.5	4.0
Benzo(a)pyrene TEQ calc(half)	mg/kg	1.2	8.6	1.4	<0.5	4.0
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	1.2	8.6	1.4	<0.5	4.0
Surrogate p-Terphenyl-d14	%	100	104	99	99	98

PAHs in Soil						
Our Reference		191242-20	191242-21	191242-22	191242-23	191242-24
Your Reference	UNITS	BH106	BH106	BH107	BH107	BH107
Depth		1.5-1.95	2.7-3.15	0.5-0.95	1.5-1.95	2.7-2.9
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Date analysed	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	0.5	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	0.2	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	2.6	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	0.8	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	4.6	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	4.6	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	2.5	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	2.2	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	3.8	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	2.4	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	1.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	0.3	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	1.3	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	27	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	3.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	3.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	3.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	101	97	98	100	94

PAHs in Soil						
Our Reference		191242-25	191242-26	191242-27	191242-28	191242-29
Your Reference	UNITS	BH108	BH108	BH108	DUP1	DUP2
Depth		0.5-0.95	1.5-1.95	4.2-4.65	-	-
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Date analysed	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	0.3	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	1.4	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	0.4	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	3.6	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	4.0	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	2.0	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	2.0	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	3.7	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	2.2	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	1.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	0.2	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	1.3	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	22	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	3.2	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	3.2	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	3.2	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	100	99	99	99	101

PAHs in Soil			
Our Reference		191242-30	191242-40
Your Reference	UNITS	DUP3	BH102
Depth		-	0-0.2
Date Sampled		03/05/2018	03/05/2018
Type of sample		soil	soil
Date extracted	-	11/05/2018	11/05/2018
Date analysed	-	11/05/2018	11/05/2018
Naphthalene	mg/kg	0.1	<0.1
Acenaphthylene	mg/kg	0.9	<0.1
Acenaphthene	mg/kg	<0.1	<0.1
Fluorene	mg/kg	0.2	<0.1
Phenanthrene	mg/kg	6.6	<0.1
Anthracene	mg/kg	1.7	<0.1
Fluoranthene	mg/kg	9.7	<0.1
Pyrene	mg/kg	9.7	<0.1
Benzo(a)anthracene	mg/kg	5.5	<0.1
Chrysene	mg/kg	4.4	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	6.8	<0.2
Benzo(a)pyrene	mg/kg	4.6	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	1.8	<0.1
Dibenzo(a,h)anthracene	mg/kg	0.6	<0.1
Benzo(g,h,i)perylene	mg/kg	2.2	<0.1
Total +ve PAH's	mg/kg	55	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	6.7	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	6.7	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	6.7	<0.5
Surrogate p-Terphenyl-d14	%	98	102

Acid Extractable metals in soil						
Our Reference		191242-1	191242-2	191242-3	191242-4	191242-6
Your Reference	UNITS	BH101	BH101	BH101	BH102	BH102
Depth		0-0.2	0.5-0.95	1.5-1.95	0.5-0.95	3-3.45
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Date analysed	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Arsenic	mg/kg	19	5	7	<4	12
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	0.7
Chromium	mg/kg	18	27	13	12	9
Copper	mg/kg	65	44	120	28	870
Lead	mg/kg	25	180	340	160	310
Mercury	mg/kg	<0.1	0.7	1.8	0.8	1.0
Nickel	mg/kg	4	21	13	4	19
Zinc	mg/kg	91	250	180	60	720

Acid Extractable metals in soil						
Our Reference		191242-7	191242-8	191242-9	191242-11	191242-12
Your Reference	UNITS	BH103	BH103	BH103	BH104	BH104
Depth		0-0.2	0.5-0.95	1.5-1.95	0.5-0.95	1.5-1.95
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Date analysed	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Arsenic	mg/kg	220	<4	<4	8	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	16	12	14	13	11
Copper	mg/kg	32	26	32	11	6
Lead	mg/kg	77	110	320	20	22
Mercury	mg/kg	2.2	0.5	0.5	<0.1	<0.1
Nickel	mg/kg	13	10	13	2	2
Zinc	mg/kg	77	94	220	11	30

Acid Extractable metals in soil						
Our Reference		191242-13	191242-14	191242-15	191242-17	191242-19
Your Reference	UNITS	BH104	BH105	BH105	BH105	BH106
Depth		3-3.45	0.5-0.95	1.5-1.95	4.5-4.95	0.5-0.95
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Date analysed	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Arsenic	mg/kg	7	5	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	15	14	14	30	11
Copper	mg/kg	37	46	33	3	44
Lead	mg/kg	150	130	120	13	100
Mercury	mg/kg	0.8	0.5	0.4	0.6	0.6
Nickel	mg/kg	8	9	5	2	10
Zinc	mg/kg	66	120	58	4	400

Acid Extractable metals in soil						
Our Reference		191242-20	191242-21	191242-22	191242-23	191242-24
Your Reference	UNITS	BH106	BH106	BH107	BH107	BH107
Depth		1.5-1.95	2.7-3.15	0.5-0.95	1.5-1.95	2.7-2.9
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Date analysed	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Arsenic	mg/kg	<4	<4	5	6	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	11	6	19	13	6
Copper	mg/kg	18	62	49	15	12
Lead	mg/kg	41	15	130	100	33
Mercury	mg/kg	0.2	<0.1	0.8	0.2	<0.1
Nickel	mg/kg	4	2	14	2	2
Zinc	mg/kg	180	240	160	49	40

Acid Extractable metals in soil						
Our Reference		191242-25	191242-26	191242-27	191242-28	191242-29
Your Reference	UNITS	BH108	BH108	BH108	DUP1	DUP2
Depth		0.5-0.95	1.5-1.95	4.2-4.65	-	-
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Date analysed	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Arsenic	mg/kg	5	8	<4	4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	16	22	18	7	5
Copper	mg/kg	38	7	<1	9	7
Lead	mg/kg	280	22	4	8	6
Mercury	mg/kg	0.6	0.2	<0.1	<0.1	<0.1
Nickel	mg/kg	8	3	<1	3	2
Zinc	mg/kg	200	140	1	34	19

Acid Extractable metals in soil					
Our Reference		191242-30	191242-40	191242-41	191242-42
Your Reference	UNITS	DUP3	BH102	BH106 - [TRIPLICATE]	BH102 - [TRIPLICATE]
Depth		-	0-0.2	2.7-3.15	3-3.45
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil
Date prepared	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Date analysed	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Arsenic	mg/kg	5	4	9	11
Cadmium	mg/kg	<0.4	<0.4	<0.4	0.4
Chromium	mg/kg	18	6	34	8
Copper	mg/kg	47	7	110	650
Lead	mg/kg	72	7	63	230
Mercury	mg/kg	0.4	<0.1	0.7	0.9
Nickel	mg/kg	10	2	3	16
Zinc	mg/kg	76	21	220	480

Moisture						
Our Reference		191242-1	191242-2	191242-3	191242-4	191242-6
Your Reference	UNITS	BH101	BH101	BH101	BH102	BH102
Depth		0-0.2	0.5-0.95	1.5-1.95	0.5-0.95	3-3.45
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Date analysed	-	14/05/2018	14/05/2018	14/05/2018	14/05/2018	14/05/2018
Moisture	%	15	4.6	6.5	9.7	8.2

Moisture						
Our Reference		191242-7	191242-8	191242-9	191242-11	191242-12
Your Reference	UNITS	BH103	BH103	BH103	BH104	BH104
Depth		0-0.2	0.5-0.95	1.5-1.95	0.5-0.95	1.5-1.95
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Date analysed	-	14/05/2018	14/05/2018	14/05/2018	14/05/2018	14/05/2018
Moisture	%	11	9.6	6.8	20	11

Moisture						
Our Reference		191242-13	191242-14	191242-15	191242-17	191242-19
Your Reference	UNITS	BH104	BH105	BH105	BH105	BH106
Depth		3-3.45	0.5-0.95	1.5-1.95	4.5-4.95	0.5-0.95
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Date analysed	-	14/05/2018	14/05/2018	14/05/2018	14/05/2018	14/05/2018
Moisture	%	13	11	6.9	8.6	11

Moisture						
Our Reference		191242-20	191242-21	191242-22	191242-23	191242-24
Your Reference	UNITS	BH106	BH106	BH107	BH107	BH107
Depth		1.5-1.95	2.7-3.15	0.5-0.95	1.5-1.95	2.7-2.9
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Date analysed	-	14/05/2018	14/05/2018	14/05/2018	14/05/2018	14/05/2018
Moisture	%	10	15	9.6	13	12

Moisture						
Our Reference		191242-25	191242-26	191242-27	191242-28	191242-29
Your Reference	UNITS	BH108	BH108	BH108	DUP1	DUP2
Depth		0.5-0.95	1.5-1.95	4.2-4.65	-	-
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	11/05/2018	11/05/2018	11/05/2018	11/05/2018	11/05/2018
Date analysed	-	14/05/2018	14/05/2018	14/05/2018	14/05/2018	14/05/2018
Moisture	%	11	8.6	18	3.6	4.5

Moisture			
Our Reference		191242-30	191242-40
Your Reference	UNITS	DUP3	BH102
Depth		-	0-0.2
Date Sampled		03/05/2018	03/05/2018
Type of sample		soil	soil
Date prepared	-	11/05/2018	11/05/2018
Date analysed	-	14/05/2018	14/05/2018
Moisture	%	8.4	4.5

Asbestos ID - soils						
Our Reference		191242-1	191242-2	191242-3	191242-4	191242-6
Your Reference	UNITS	BH101	BH101	BH101	BH102	BH102
Depth		0-0.2	0.5-0.95	1.5-1.95	0.5-0.95	3-3.45
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date analysed	-	15/05/2018	15/05/2018	15/05/2018	15/05/2018	15/05/2018
Sample mass tested	g	Approx. 10g	Approx. 55g	Approx. 25g	Approx. 50g	Approx. 30g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils						
Our Reference		191242-7	191242-8	191242-9	191242-11	191242-12
Your Reference	UNITS	BH103	BH103	BH103	BH104	BH104
Depth		0-0.2	0.5-0.95	1.5-1.95	0.5-0.95	1.5-1.95
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date analysed	-	15/05/2018	15/05/2018	15/05/2018	15/05/2018	15/05/2018
Sample mass tested	g	Approx. 15g	Approx. 30g	Approx. 25g	Approx. 15g	Approx. 35g
Sample Description	-	Beige sandy soil	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils						
Our Reference		191242-13	191242-14	191242-15	191242-17	191242-19
Your Reference	UNITS	BH104	BH105	BH105	BH105	BH106
Depth		3-3.45	0.5-0.95	1.5-1.95	4.5-4.95	0.5-0.95
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date analysed	-	15/05/2018	15/05/2018	15/05/2018	15/05/2018	15/05/2018
Sample mass tested	g	Approx. 15g	Approx. 10g	Approx. 5g	Approx. 10g	Approx. 20g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils						
Our Reference		191242-20	191242-21	191242-22	191242-23	191242-24
Your Reference	UNITS	BH106	BH106	BH107	BH107	BH107
Depth		1.5-1.95	2.7-3.15	0.5-0.95	1.5-1.95	2.7-2.9
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date analysed	-	15/05/2018	15/05/2018	15/05/2018	15/05/2018	15/05/2018
Sample mass tested	g	Approx. 20g	Approx. 50g	Approx. 10g	Approx. 40g	Approx. 50g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown fine-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils					
Our Reference		191242-25	191242-26	191242-27	191242-40
Your Reference	UNITS	BH108	BH108	BH108	BH102
Depth		0.5-0.95	1.5-1.95	4.2-4.65	0-0.2
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil
Date analysed	-	15/05/2018	15/05/2018	15/05/2018	15/05/2018
Sample mass tested	g	Approx. 45g	Approx. 40g	Approx. 65g	Approx. 25g
Sample Description	-	Brown rocks	Brown coarse-grained soil & rocks	Beige sandy soil & rocks	Brown fine-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

sPOCAS + %S w/w						
Our Reference		191242-32	191242-33	191242-35	191242-36	191242-38
Your Reference	UNITS	BH105	BH106	BH107	BH107	BH108
Depth		5.5-5.7	2-2.5	1-1.5	2.5-2.7	2.5-2.7
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	15/05/2018	15/05/2018	15/05/2018	15/05/2018	15/05/2018
Date analysed	-	15/05/2018	15/05/2018	15/05/2018	15/05/2018	15/05/2018
pH $_{kcl}$	pH units	6.0	8.6	7.2	8.7	8.9
TAA pH 6.5	moles H^+ /t	<5	<5	<5	<5	<5
s-TAA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
pH $_{Ox}$	pH units	2.8	7.3	6.4	7.6	7.7
TPA pH 6.5	moles H^+ /t	85	<5	<5	<5	<5
s-TPA pH 6.5	%w/w S	0.14	<0.01	<0.01	<0.01	<0.01
TSA pH 6.5	moles H^+ /t	84	<5	<5	<5	<5
s-TSA pH 6.5	%w/w S	0.13	<0.01	<0.01	<0.01	<0.01
ANC_E	% $CaCO_3$	<0.05	0.63	<0.05	0.88	1.0
a-ANC_E	moles H^+ /t	<5	120	<5	180	200
s-ANC_E	%w/w S	<0.05	0.20	<0.05	0.28	0.32
S_{KCl}	%w/w S	0.01	<0.005	<0.005	0.005	0.007
S_P	%w/w	0.1	0.008	<0.005	0.01	0.01
S_{POS}	%w/w	0.08	<0.005	<0.005	0.006	0.005
a-S_{POS}	moles H^+ /t	51	<5	<5	<5	<5
Ca_{KCl}	%w/w	0.04	0.17	0.09	0.23	0.24
Ca_P	%w/w	0.18	0.19	0.09	0.29	0.35
Ca_A	%w/w	0.13	0.021	<0.005	0.058	0.11
Mg_{KCl}	%w/w	0.016	0.011	0.009	0.012	0.013
Mg_P	%w/w	0.028	0.016	0.008	0.014	0.020
Mg_A	%w/w	0.012	0.005	<0.005	<0.005	<0.005
S_{HCl}	%w/w S	<0.005	<0.005	<0.005	<0.005	<0.005
S_{NAS}	%w/w S	<0.005	<0.005	<0.005	<0.005	<0.005
a-S_{NAS}	moles H^+ /t	<5	<5	<5	<5	<5
s-S_{NAS}	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
Fineness Factor	-	1.5	1.5	1.5	1.5	1.5
a-Net Acidity	moles H^+ /t	52	<5	<5	<5	<5
s-Net Acidity	%w/w S	0.08	<0.01	<0.01	<0.01	<0.01
Liming rate	kg $CaCO_3$ /t	3.9	<0.75	<0.75	<0.75	<0.75
s-Net Acidity without -ANCE	%w/w S	0.084	<0.01	<0.01	<0.01	<0.01
a-Net Acidity without ANCE	moles H^+ /t	52	<5	<5	<5	<5
Liming rate without ANCE	kg $CaCO_3$ /t	3.9	<0.75	<0.75	<0.75	<0.75

sPOCAS + %S w/w		
Our Reference		191242-39
Your Reference	UNITS	BH108
Depth		4-45
Date Sampled		03/05/2018
Type of sample		soil
Date prepared	-	15/05/2018
Date analysed	-	15/05/2018
pH $_{kcl}$	pH units	6.0
TAA pH 6.5	moles H^+ /t	<5
s-TAA pH 6.5	%w/w S	<0.01
pH $_{Ox}$	pH units	3.7
TPA pH 6.5	moles H^+ /t	65
s-TPA pH 6.5	%w/w S	0.10
TSA pH 6.5	moles H^+ /t	64
s-TSA pH 6.5	%w/w S	0.10
ANC_E	% $CaCO_3$	<0.05
a-ANC_E	moles H^+ /t	<5
s-ANC_E	%w/w S	<0.05
S_{KCl}	%w/w S	0.01
S_P	%w/w	<0.005
S_{POS}	%w/w	<0.005
a-S_{POS}	moles H^+ /t	<5
Ca_{KCl}	%w/w	0.16
Ca_P	%w/w	<0.005
Ca_A	%w/w	<0.005
Mg_{KCl}	%w/w	0.030
Mg_P	%w/w	<0.005
Mg_A	%w/w	<0.005
S_{HCl}	%w/w S	<0.005
S_{NAS}	%w/w S	<0.005
a-S_{NAS}	moles H^+ /t	<5
s-S_{NAS}	%w/w S	<0.01
Fineness Factor	-	1.5
a-Net Acidity	moles H^+ /t	<5
s-Net Acidity	%w/w S	<0.01
Liming rate	kg $CaCO_3$ /t	<0.75
s-Net Acidity without -ANCE	%w/w S	<0.01
a-Net Acidity without ANCE	moles H^+ /t	<5
Liming rate without ANCE	kg $CaCO_3$ /t	<0.75

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Inorg-064	sPOCAS determined using titrimetric and ICP-AES techniques. Based on Acid Sulfate Soils Laboratory Methods Guidelines, Version 2.1 - June 2004.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.

Method ID	Methodology Summary
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	191242-2
Date extracted	-			11/05/2018	1	11/05/2018	11/05/2018		11/05/2018	11/05/2018
Date analysed	-			14/05/2018	1	14/05/2018	14/05/2018		14/05/2018	14/05/2018
TRH C_6 - C_9	mg/kg	25	Org-016	<25	1	<25	<25	0	93	90
TRH C_6 - C_{10}	mg/kg	25	Org-016	<25	1	<25	<25	0	93	90
Benzene	mg/kg	0.2	Org-016	<0.2	1	<0.2	<0.2	0	106	103
Toluene	mg/kg	0.5	Org-016	<0.5	1	<0.5	<0.5	0	96	92
Ethylbenzene	mg/kg	1	Org-016	<1	1	<1	<1	0	79	79
m+p-xylene	mg/kg	2	Org-016	<2	1	<2	<2	0	91	89
o-Xylene	mg/kg	1	Org-016	<1	1	<1	<1	0	86	84
naphthalene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	97	1	92	92	0	97	95

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	191242-22
Date extracted	-			[NT]	11	11/05/2018	11/05/2018		11/05/2018	11/05/2018
Date analysed	-			[NT]	11	14/05/2018	14/05/2018		14/05/2018	14/05/2018
TRH C_6 - C_9	mg/kg	25	Org-016	[NT]	11	<25	<25	0	89	90
TRH C_6 - C_{10}	mg/kg	25	Org-016	[NT]	11	<25	<25	0	89	90
Benzene	mg/kg	0.2	Org-016	[NT]	11	<0.2	<0.2	0	102	105
Toluene	mg/kg	0.5	Org-016	[NT]	11	<0.5	<0.5	0	92	93
Ethylbenzene	mg/kg	1	Org-016	[NT]	11	<1	<1	0	77	76
m+p-xylene	mg/kg	2	Org-016	[NT]	11	<2	<2	0	88	87
o-Xylene	mg/kg	1	Org-016	[NT]	11	<1	<1	0	83	82
naphthalene	mg/kg	1	Org-014	[NT]	11	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	[NT]	11	94	92	2	96	93

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	21	11/05/2018	11/05/2018		[NT]	[NT]
Date analysed	-			[NT]	21	14/05/2018	14/05/2018		[NT]	[NT]
TRH C_6 - C_9	mg/kg	25	Org-016	[NT]	21	<25	<25	0	[NT]	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-016	[NT]	21	<25	<25	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-016	[NT]	21	<0.2	<0.2	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-016	[NT]	21	<0.5	<0.5	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-016	[NT]	21	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-016	[NT]	21	<2	<2	0	[NT]	[NT]
o-Xylene	mg/kg	1	Org-016	[NT]	21	<1	<1	0	[NT]	[NT]
naphthalene	mg/kg	1	Org-014	[NT]	21	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	[NT]	21	90	93	3	[NT]	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	191242-2
Date extracted	-			11/05/2018	1	11/05/2018	11/05/2018		11/05/2018	11/05/2018
Date analysed	-			11/05/2018	1	11/05/2018	11/05/2018		11/05/2018	11/05/2018
TRH C_{10} - C_{14}	mg/kg	50	Org-003	<50	1	<50	<50	0	109	85
TRH C_{15} - C_{28}	mg/kg	100	Org-003	<100	1	<100	<100	0	89	#
TRH C_{29} - C_{36}	mg/kg	100	Org-003	<100	1	120	<100	18	77	103
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	<50	1	<50	<50	0	109	85
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	<100	1	140	100	33	89	#
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	<100	1	<100	<100	0	77	103
Surrogate o-Terphenyl	%		Org-003	75	1	100	80	22	95	82

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	191242-22
Date extracted	-			[NT]	11	11/05/2018	11/05/2018		11/05/2018	11/05/2018
Date analysed	-			[NT]	11	11/05/2018	11/05/2018		11/05/2018	11/05/2018
TRH C_{10} - C_{14}	mg/kg	50	Org-003	[NT]	11	<50	<50	0	97	92
TRH C_{15} - C_{28}	mg/kg	100	Org-003	[NT]	11	<100	<100	0	77	76
TRH C_{29} - C_{36}	mg/kg	100	Org-003	[NT]	11	<100	<100	0	77	109
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	[NT]	11	<50	<50	0	97	92
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	[NT]	11	<100	<100	0	77	76
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	[NT]	11	<100	<100	0	77	109
Surrogate o-Terphenyl	%		Org-003	[NT]	11	76	76	0	81	78

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	21	11/05/2018	11/05/2018		[NT]	[NT]
Date analysed	-			[NT]	21	11/05/2018	11/05/2018		[NT]	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-003	[NT]	21	<50	<50	0	[NT]	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-003	[NT]	21	<100	<100	0	[NT]	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-003	[NT]	21	<100	<100	0	[NT]	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	[NT]	21	<50	<50	0	[NT]	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	[NT]	21	<100	<100	0	[NT]	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	[NT]	21	<100	<100	0	[NT]	[NT]
Surrogate o-Terphenyl	%		Org-003	[NT]	21	75	74	1	[NT]	[NT]

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	191242-2
Date extracted	-			11/05/2018	1	11/05/2018	11/05/2018		11/05/2018	11/05/2018
Date analysed	-			11/05/2018	1	11/05/2018	11/05/2018		11/05/2018	11/05/2018
Naphthalene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	98	90
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	95	90
Phenanthrene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	100	71
Anthracene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	1	0.2	0.1	67	99	#
Pyrene	mg/kg	0.1	Org-012	<0.1	1	0.2	0.2	0	99	#
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012	<0.1	1	0.1	0.1	0	96	66
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012	<0.2	1	0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	1	0.1	0.1	0	96	#
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012	101	1	102	100	2	96	100

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	191242-22
Date extracted	-			[NT]	11	11/05/2018	11/05/2018		11/05/2018	11/05/2018
Date analysed	-			[NT]	11	11/05/2018	11/05/2018		11/05/2018	11/05/2018
Naphthalene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	100	92
Acenaphthylene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	97	90
Phenanthrene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	101	64
Anthracene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	101	72
Pyrene	mg/kg	0.1	Org-012	[NT]	11	0.1	<0.1	0	101	71
Benzo(a)anthracene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	98	84
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012	[NT]	11	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012	[NT]	11	0.05	<0.05	0	95	80
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012	[NT]	11	101	99	2	101	119

QUALITY CONTROL: PAHs in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	21	11/05/2018	11/05/2018		[NT]	[NT]
Date analysed	-			[NT]	21	11/05/2018	11/05/2018		[NT]	[NT]
Naphthalene	mg/kg	0.1	Org-012	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Acenaphthylene	mg/kg	0.1	Org-012	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Phenanthrene	mg/kg	0.1	Org-012	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Anthracene	mg/kg	0.1	Org-012	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Pyrene	mg/kg	0.1	Org-012	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-012	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012	[NT]	21	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012	[NT]	21	<0.05	<0.05	0	[NT]	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012	[NT]	21	97	97	0	[NT]	[NT]

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	191242-2
Date prepared	-			11/05/2018	1	11/05/2018	11/05/2018		11/05/2018	11/05/2018
Date analysed	-			11/05/2018	1	11/05/2018	11/05/2018		11/05/2018	11/05/2018
Arsenic	mg/kg	4	Metals-020	<4	1	19	18	5	108	87
Cadmium	mg/kg	0.4	Metals-020	<0.4	1	<0.4	<0.4	0	103	84
Chromium	mg/kg	1	Metals-020	<1	1	18	20	11	106	100
Copper	mg/kg	1	Metals-020	<1	1	65	59	10	107	115
Lead	mg/kg	1	Metals-020	<1	1	25	19	27	104	119
Mercury	mg/kg	0.1	Metals-021	<0.1	1	<0.1	<0.1	0	98	94
Nickel	mg/kg	1	Metals-020	<1	1	4	4	0	98	99
Zinc	mg/kg	1	Metals-020	<1	1	91	74	21	101	#

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	191242-22
Date prepared	-			[NT]	11	11/05/2018	11/05/2018		11/05/2018	11/05/2018
Date analysed	-			[NT]	11	11/05/2018	11/05/2018		11/05/2018	11/05/2018
Arsenic	mg/kg	4	Metals-020	[NT]	11	8	10	22	109	83
Cadmium	mg/kg	0.4	Metals-020	[NT]	11	<0.4	<0.4	0	105	84
Chromium	mg/kg	1	Metals-020	[NT]	11	13	15	14	108	92
Copper	mg/kg	1	Metals-020	[NT]	11	11	11	0	109	96
Lead	mg/kg	1	Metals-020	[NT]	11	20	19	5	107	#
Mercury	mg/kg	0.1	Metals-021	[NT]	11	<0.1	<0.1	0	105	114
Nickel	mg/kg	1	Metals-020	[NT]	11	2	2	0	99	91
Zinc	mg/kg	1	Metals-020	[NT]	11	11	9	20	102	#

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	21	11/05/2018	11/05/2018		[NT]	[NT]
Date analysed	-			[NT]	21	11/05/2018	11/05/2018		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	21	<4	5	22	[NT]	[NT]
Cadmium	mg/kg	0.4	Metals-020	[NT]	21	<0.4	<0.4	0	[NT]	[NT]
Chromium	mg/kg	1	Metals-020	[NT]	21	6	15	86	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	21	62	150	83	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	21	15	44	98	[NT]	[NT]
Mercury	mg/kg	0.1	Metals-021	[NT]	21	<0.1	0.6	143	[NT]	[NT]
Nickel	mg/kg	1	Metals-020	[NT]	21	2	3	40	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	21	240	270	12	[NT]	[NT]

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	6	11/05/2018	11/05/2018		[NT]	[NT]
Date analysed	-			[NT]	6	11/05/2018	11/05/2018		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	6	12	13	8	[NT]	[NT]
Cadmium	mg/kg	0.4	Metals-020	[NT]	6	0.7	<0.4	55	[NT]	[NT]
Chromium	mg/kg	1	Metals-020	[NT]	6	9	10	11	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	6	870	660	27	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	6	310	220	34	[NT]	[NT]
Mercury	mg/kg	0.1	Metals-021	[NT]	6	1.0	1.1	10	[NT]	[NT]
Nickel	mg/kg	1	Metals-020	[NT]	6	19	13	38	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	6	720	400	57	[NT]	[NT]

QUALITY CONTROL: sPOCAS + %S w/w						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	[NT]
Date prepared	-			15/05/2018	[NT]	[NT]	[NT]	[NT]	15/05/2018	[NT]
Date analysed	-			15/05/2018	[NT]	[NT]	[NT]	[NT]	15/05/2018	[NT]
pH $_{kcl}$	pH units		Inorg-064	[NT]	[NT]	[NT]	[NT]	[NT]	91	[NT]
TAA pH 6.5	moles H^+ /t	5	Inorg-064	<5	[NT]	[NT]	[NT]	[NT]	95	[NT]
s-TAA pH 6.5	%w/w S	0.01	Inorg-064	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pH $_{Ox}$	pH units		Inorg-064	[NT]	[NT]	[NT]	[NT]	[NT]	100	[NT]
TPA pH 6.5	moles H^+ /t	5	Inorg-064	<5	[NT]	[NT]	[NT]	[NT]	85	[NT]
s-TPA pH 6.5	%w/w S	0.01	Inorg-064	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
TSA pH 6.5	moles H^+ /t	5	Inorg-064	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
s-TSA pH 6.5	%w/w S	0.01	Inorg-064	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
ANC_E	% $CaCO_3$	0.05	Inorg-064	<0.05	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
a-ANC_E	moles H^+ /t	5	Inorg-064	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
s-ANC_E	%w/w S	0.05	Inorg-064	<0.05	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
S_{KCl}	%w/w S	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
S_P	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
S_{POS}	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
a-S_{POS}	moles H^+ /t	5	Inorg-064	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ca_{KCl}	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ca_P	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ca_A	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Mg_{KCl}	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Mg_P	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Mg_A	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
S_{HCl}	%w/w S	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
S_{NAS}	%w/w S	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
a-S_{NAS}	moles H^+ /t	5	Inorg-064	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
s-S_{NAS}	%w/w S	0.01	Inorg-064	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fineness Factor	-	1.5	Inorg-064	<1.5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
a-Net Acidity	moles H^+ /t	5	Inorg-064	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
s-Net Acidity	%w/w S	0.01	Inorg-064	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Liming rate	kg $CaCO_3$ /t	0.75	Inorg-064	<0.75	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
s-Net Acidity without -ANCE	%w/w S	0.01	Inorg-064	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
a-Net Acidity without ANCE	moles H^+ /t	5	Inorg-064	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]

QUALITY CONTROL: sPOCAS + %S w/w						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	[NT]
Liming rate without ANCE	kg $CaCO_3$/t	0.75	Inorg-064	<0.75	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Report Comments

svTRH (C10-C40) in Soil - (2MS)# Percent recovery is not possible to report as the high concentration of analytes in the sample/s have caused interference..

PAHs in Soil - # Percent recovery is not possible to report as the high concentration of analytes in the sample/s have caused interference.

Acid Extractable Metals in Soil: The laboratory RPD acceptance criteria has been exceeded for 191242-21 for Cr, Cu and Pb. Therefore a triplicate result has been issued as laboratory sample number 191242-41.

Acid Extractable Metals in Soil:
Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

Acid Extractable Metals in Soil: The laboratory RPD acceptance criteria has been exceeded for 191242-6 for Zn. Therefore a triplicate result has been issued as laboratory sample number 191242-42.

Asbestos: A portion of the supplied samples were sub-sampled for asbestos analysis according to Envirolab procedures.
We cannot guarantee that these sub-samples are indicative of the entire sample.
Envirolab recommends supplying 40-50g of sample in its own container.
Note: Samples 191242-24, 27 & 40 were sub-sampled from jars provided by the client.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Environmental Investigation Services
Attention	Todd Hore

Sample Login Details

Your reference	E30361KH, Ultimo
Envirolab Reference	191242
Date Sample Received	10/05/2018
Date Instructions Received	10/05/2018
Date Results Expected to be Reported	17/05/2018

Sample Condition

Samples received in appropriate condition for analysis	YES
No. of Samples Provided	40 soil
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	16.7
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Acid Extractable metalsin soil	Asbestos ID - soils	sPOCAS + %S w/w	On Hold
BH101-0-0.2	✓	✓	✓	✓	✓		
BH101-0.5-0.95	✓	✓	✓	✓	✓		
BH101-1.5-1.95	✓	✓	✓	✓	✓		
BH102-0.5-0.95	✓	✓	✓	✓	✓		
BH102-1.5-1.95							✓
BH102-3-3.45	✓	✓	✓	✓	✓		
BH103-0-0.2	✓	✓	✓	✓	✓		
BH103-0.5-0.95	✓	✓	✓	✓	✓		
BH103-1.5-1.95	✓	✓	✓	✓	✓		
BH104-0-0.2							✓
BH104-0.5-0.95	✓	✓	✓	✓	✓		
BH104-1.5-1.95	✓	✓	✓	✓	✓		
BH104-3-3.45	✓	✓	✓	✓	✓		
BH105-0.5-0.95	✓	✓	✓	✓	✓		
BH105-1.5-1.95	✓	✓	✓	✓	✓		
BH105-3-3.45							✓
BH105-4.5-4.95	✓	✓	✓	✓	✓		
BH105-5.7-6.15							✓
BH106-0.5-0.95	✓	✓	✓	✓	✓		
BH106-1.5-1.95	✓	✓	✓	✓	✓		
BH106-2.7-3.15	✓	✓	✓	✓	✓		
BH107-0.5-0.95	✓	✓	✓	✓	✓		
BH107-1.5-1.95	✓	✓	✓	✓	✓		
BH107-2.7-2.9	✓	✓	✓	✓	✓		
BH108-0.5-0.95	✓	✓	✓	✓	✓		
BH108-1.5-1.95	✓	✓	✓	✓	✓		
BH108-4.2-4.65	✓	✓	✓	✓	✓		
DUP1	✓	✓	✓	✓			
DUP2	✓	✓	✓	✓			
DUP3	✓	✓	✓	✓			
TB1	✓						
BH105-5.5-5.7						✓	

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ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Acid Extractable metalsin soil	Asbestos ID - soils	sPOCAS + %S w/w	On Hold
BH106-2-2.5						✓	
BH107-0.31-0.5							✓
BH107-1-1.5						✓	
BH107-2.5-2.7						✓	
BH108-1-1.5							✓
BH108-2.5-2.7						✓	
BH108-4-45						✓	
BH102-0-0.2	✓	✓	✓	✓	✓		

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.

SAMPLE AND CHAIN OF CUSTODY FORM

TO:		FROM:
ENVIROLAB SERVICES PTY LTD	EIS Job Number: E30361KH	ENVIRONMENTAL INVESTIGATION SERVICES
12 ASHLEY STREET		REAR OF 115 WICKS ROAD
CHATSWOOD NSW 2067		MACQUARIE PARK, NSW 2113
P: (02) 99106200	Date Results Required: STANDARD	P: 02-9888 5000 F: 02-9888 5001
F: (02) 99106201		Attention: Todd Hore
Attention: Aileen	Page: 1	

Location:	Ultimo						Sample Preserved in Esky on Ice												
Sampler:	TC						Tests Required												
Date Sampled	Lab Ref:	Sample Number	Depth (m)	Sample Container	PID	Sample Description	Combo 2	Combo 3a	Combo 6	Combo 6a	8 Metals	PAHs	TRH/BTEX	BTEX	Asbestos	sPOCAS			
03-05-18	1	BH101	0-0.2	G, A	0	Fill: silty sand		X											
03-05-18	2	BH101	0.5-0.95	G, A	0	Fill: gravelly sand		X											
03-05-18	3	BH101	1.5-1.95	G, A	0	Fill: gravelly sand		X											
03-05-18	N/A	BH101	3-3.2	G, A	0	Fill: gravelly sand													
03-05-18	4	BH102	0-0.2	G,	0	Fill: silty sand		X											
03-05-18	4	BH102	0.5-0.95	G, A	0	Fill: silty sand		X											
03-05-18	5	BH102	1.5-1.95	G, A	0	Fill: gravelly sand													
03-05-18	6	BH102	3-3.45	G, A	0	Fill: gravelly sand		X											
04-05-18	7	BH103	0-0.2	G, A	0	Fill: gravelly sand		X											
04-05-18	8	BH103	0.5-0.95	G, A	0	Fill: gravelly sand		X											
04-05-18	9	BH103	1.5-1.95	G, A	0	Fill: gravelly sand		X											
04-05-18	10	BH104	0-0.2	G, A	0	Fill: silty clay													
04-05-18	11	BH104	0.5-0.95	G, A	0	Fill: silty clay		X											
07-08-16	12	BH104	1.5-1.95	G, A	0	Fill: clayey sand		X											
04-05-18	13	BH104	3-3.45	G, A	0	Fill: clayey sand		X											
07-05-18	14	BH105	0.5-0.95	G, A	0	Fill: sandy clay		X											
07-05-18	15	BH105	1.5-1.95	G, A	0	Fill: sandy clay		X											
07-05-18	16	BH105	3-3.45	G, A	0	Fill: clayey sand													
07-05-18	17	BH105	4.5-4.95	G, A	0	Fill: clayey sand		X											
07-05-18	18	BH105	5.7-6.15	G, A	0	Fill: clayey sand													
07-05-18	19	BH106	0.5-0.95	G, A	0	Fill: sandy clay		X											
07-05-18	20	BH106	1.5-1.95	G, A	0.5	Fill: sandy clay		X											
07-05-18	21	BH106	2.7-3.15	G, A	0	Fill: sandy clay		X											

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 191242
Date Received: 10/5
Time Received: 08:45
Received by: PH
Temp: Cool/Ambient
Cooling: Icepack
Security: Intact/Broken/None

Remarks (comments/detection limits required):

Sample Containers:
G - 250mg Glass Jar
A - Ziplock Asbestos Bag
P - Plastic Bag

Relinquished By:	Date:	Time:	Received By:	Date:
	9/5/18	2.30pm		10/5

SAMPLE AND CHAIN OF CUSTODY FORM

TO:		FROM:
ENVIROLAB SERVICES PTY LTD 12 ASHLEY STREET CHATSWOOD NSW 2067 P: (02) 99106200 F: (02) 99106201 Attention: Aileen	EIS Job Number: E30361KH Date Results Required: STANDARD Page: 2	ENVIRONMENTAL INVESTIGATION SERVICES REAR OF 115 WICKS ROAD MACQUARIE PARK, NSW 2113 P: 02-9888 5000 F: 02-9888 5001 Attention: Todd Hore

Location: Ultimo

Sampler: TC

Sample Preserved in Esky on Ice

Tests Required

	Date Sampled	Lab Ref:	Sample Number	Depth (m)	Sample Container	PID	Sample Description	Combo 2	Combo 3a	Combo 3	Combo 6a	8 Metals	PAHs	TRH/BTEX	BTEX	Asbestos	sPOCAS		
91242	08-05-18	22	BH107	0.5-0.95	G, A	0	Fill: clayey sand		X										
	08-05-18	23	BH107	1.5-1.95	G, A	0	Fill: clayey sand		X										
	08-05-18	24	BH107	2.7-2.9	G	0	Silty sand		X										
	08-05-18	25	BH108	0.5-0.95	G, A	0	Fill: sandy clay		X										
	08-05-18	26	BH108	1.5-1.95	G, A	0	Fill: silty sand		X										
N|R	08-05-18	~~27~~	BH108	3-3.45	G, A	0	Fill: sandy clay												
27	08-05-18	~~28~~	BH108	4.2-4.65	G, A	0	Sandy clay		X										
28	03-05-18	~~29~~	Dup 1		G	0	Soil			X									
29	03-05-18	~~30~~	Dup 2		G	0	Soil			X									
30	08-05-18	~~31~~	Dup 3		G	0	Soil			X									
/	08-05-18	~~32~~	Dup 4		G	0	Soil			X									
31 ~~32~~	07-05-18	~~33~~	TB1		G	–	Soil								X				
32 ~~33~~	07-05-18	~~34~~	BH105	5.5-5.7	P	–	Fill: sandy clay										X		
33 ~~34~~	07-05-18	~~35~~	BH106	2-2.5	P	–	Fill: sandy clay										X		
34 ~~35~~	08-05-18	~~36~~	BH107	0.31-0.5	P	–	Fill: silty clay												
35 ~~36~~	08-05-18	~~37~~	BH107	1-1.5	P	–	Fill: silty sand										X		
36 ~~37~~	08-05-18	~~38~~	BH107	2.5-2.7	P	–	Fill: clayey sand										X		
37 ~~38~~	08-05-18	~~39~~	BH108	1-1.5	P	–	Fill: silty sand												
38 ~~39~~	08-05-18	~~40~~	BH108	2.5-2.7	P	–	Fill: sandy clay										X		
39 ~~40~~	08-05-18	~~41~~	BH108	4-4.5	P	–	Sandy clay										X		

Remarks (comments/detection limits required):
Please send Dup4 as inter-lab Dup to Melbourne

Sample Containers:
G - 250mg Glass Jar
~~A - Ziplock Asbestos Bag~~
P - Plastic Bag

Relinquished By:	Date:	Time:	Received By:	Date:
	9/5/18	2.30pm	ES	10/5

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ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 191242-A

Client Details

Client	Environmental Investigation Services
Attention	Todd Hore
Address	PO Box 976, North Ryde BC, NSW, 1670

Sample Details

Your Reference	**E30361KH, Ultimo**
Number of Samples	Additional Testing on 13 Soils
Date samples received	10/05/2018
Date completed instructions received	18/05/2018

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	25/05/2018
Date of Issue	25/05/2018

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Asbestos Approved By
Analysed by Asbestos Approved Identifier: Lucy Zhu
Authorised by Asbestos Approved Signatory: Matt Tang

Results Approved By
Jeremy Faircloth, Organics Supervisor
Long Pham, Team Leader, Metals
Nick Sarlamis, Inorganics Supervisor
Priya Samarawickrama, Senior Chemist

Authorised By

Jacinta Hurst, Laboratory Manager

Misc Inorg - Soil			
Our Reference		191242-A-6	191242-A-19
Your Reference	UNITS	BH102	BH106
Depth		3-3.45	0.5-0.95
Date Sampled		03/05/2018	03/05/2018
Type of sample		soil	soil
Date prepared	-	23/05/2018	23/05/2018
Date analysed	-	23/05/2018	23/05/2015
pH 1:5 soil:water	pH Units	6.8	7.6

CEC			
Our Reference		191242-A-6	191242-A-19
Your Reference	UNITS	BH102	BH106
Depth		3-3.45	0.5-0.95
Date Sampled		03/05/2018	03/05/2018
Type of sample		soil	soil
Date prepared	-	22/05/2018	22/05/2018
Date analysed	-	22/05/2018	22/05/2018
Exchangeable Ca	meq/100g	27	9.0
Exchangeable K	meq/100g	0.3	0.1
Exchangeable Mg	meq/100g	0.62	1.2
Exchangeable Na	meq/100g	<0.1	<0.1
Cation Exchange Capacity	meq/100g	28	10

Clay 50-120g			
Our Reference		191242-A-6	191242-A-19
Your Reference	UNITS	BH102	BH106
Depth		3-3.45	0.5-0.95
Date Sampled		03/05/2018	03/05/2018
Type of sample		soil	soil
Date prepared	-	22/05/2018	22/05/2018
Date analysed	-	23/05/2018	23/05/2018
Clay in soils <2µm	% (w/w)	17	24

Metals in TCLP USEPA1311						
Our Reference		191242-A-2	191242-A-3	191242-A-4	191242-A-6	191242-A-7
Your Reference	UNITS	BH101	BH101	BH102	BH102	BH103
Depth		0.5-0.95	1.5-1.95	0.5-0.95	3-3.45	0-0.2
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	21/05/2018	21/05/2018	21/05/2018	21/05/2018	21/05/2018
Date analysed	-	21/05/2018	21/05/2018	21/05/2018	21/05/2018	21/05/2018
pH of soil for fluid# determ.	pH units	9.2	8.0	9.4	9.4	9.9
pH of soil TCLP (after HCl)	pH units	1.7	1.6	1.6	1.7	1.6
Extraction fluid used	-	1	1	1	1	1
pH of final Leachate	pH units	5.2	5.1	5.2	6.0	6.4
Arsenic in TCLP	mg/L	[NA]	[NA]	[NA]	[NA]	<0.05
Lead in TCLP	mg/L	0.08	0.09	0.06	0.2	[NA]

Metals in TCLP USEPA1311						
Our Reference		191242-A-8	191242-A-9	191242-A-13	191242-A-14	191242-A-15
Your Reference	UNITS	BH103	BH103	BH104	BH105	BH105
Depth		0.5-0.95	1.5-1.95	3-3.45	0.5-0.95	1.5-1.95
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	21/05/2018	21/05/2018	21/05/2018	21/05/2018	21/05/2018
Date analysed	-	21/05/2018	21/05/2018	21/05/2018	21/05/2018	21/05/2018
pH of soil for fluid# determ.	pH units	9.5	9.4	8.7	10.1	9.5
pH of soil TCLP (after HCl)	pH units	1.7	1.7	1.6	1.7	1.7
Extraction fluid used	-	1	1	1	1	1
pH of final Leachate	pH units	6.0	5.6	5.0	5.4	6.0
Lead in TCLP	mg/L	0.04	0.33	0.07	0.06	<0.03

Metals in TCLP USEPA1311				
Our Reference		191242-A-19	191242-A-22	191242-A-25
Your Reference	UNITS	BH106	BH107	BH108
Depth		0.5-0.95	0.5-0.95	0.5-0.95
Date Sampled		03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil
Date extracted	-	21/05/2018	21/05/2018	21/05/2018
Date analysed	-	[NA]	21/05/2018	21/05/2018
pH of soil for fluid# determ.	pH units	7.6	7.4	7.2
pH of soil TCLP (after HCl)	pH units	1.6	1.6	1.6
Extraction fluid used	-	1	1	1
pH of final Leachate	pH units	5.0	5.0	5.0
Lead in TCLP	mg/L	[NA]	<0.03	0.06

PAHs in TCLP (USEPA 1311)						
Our Reference		191242-A-2	191242-A-3	191242-A-13	191242-A-14	191242-A-15
Your Reference	UNITS	BH101	BH101	BH104	BH105	BH105
Depth		0.5-0.95	1.5-1.95	3-3.45	0.5-0.95	1.5-1.95
Date Sampled		03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	21/05/2018	21/05/2018	21/05/2018	21/05/2018	21/05/2018
Date analysed	-	21/05/2018	21/05/2018	21/05/2018	21/05/2018	21/05/2018
Naphthalene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Acenaphthylene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Acenaphthene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Fluorene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Phenanthrene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Anthracene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Fluoranthene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Pyrene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Benzo(a)anthracene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Chrysene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Benzo(bjk)fluoranthene in TCLP	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Benzo(a)pyrene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Dibenzo(a,h)anthracene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Benzo(g,h,i)perylene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Total +ve PAH's	mg/L	NIL (+)VE	NIL (+)VE	NIL (+)VE	NIL (+)VE	NIL (+)VE
Surrogate p-Terphenyl-d14	%	98	91	98	95	88

PAHs in TCLP (USEPA 1311)				
Our Reference		191242-A-19	191242-A-22	191242-A-25
Your Reference	UNITS	BH106	BH107	BH108
Depth		0.5-0.95	0.5-0.95	0.5-0.95
Date Sampled		03/05/2018	03/05/2018	03/05/2018
Type of sample		soil	soil	soil
Date extracted	-	21/05/2018	21/05/2018	21/05/2018
Date analysed	-	21/05/2018	21/05/2018	21/05/2018
Naphthalene in TCLP	mg/L	<0.001	<0.001	<0.001
Acenaphthylene in TCLP	mg/L	<0.001	<0.001	<0.001
Acenaphthene in TCLP	mg/L	<0.001	<0.001	<0.001
Fluorene in TCLP	mg/L	<0.001	<0.001	<0.001
Phenanthrene in TCLP	mg/L	<0.001	<0.001	<0.001
Anthracene in TCLP	mg/L	<0.001	<0.001	<0.001
Fluoranthene in TCLP	mg/L	<0.001	<0.001	<0.001
Pyrene in TCLP	mg/L	<0.001	<0.001	<0.001
Benzo(a)anthracene in TCLP	mg/L	<0.001	<0.001	<0.001
Chrysene in TCLP	mg/L	<0.001	<0.001	<0.001
Benzo(bjk)fluoranthene in TCLP	mg/L	<0.002	<0.002	<0.002
Benzo(a)pyrene in TCLP	mg/L	<0.001	<0.001	<0.001
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	<0.001	<0.001	<0.001
Dibenzo(a,h)anthracene in TCLP	mg/L	<0.001	<0.001	<0.001
Benzo(g,h,i)perylene in TCLP	mg/L	<0.001	<0.001	<0.001
Total +ve PAH's	mg/L	NIL (+)VE	NIL (+)VE	NIL (+)VE
Surrogate p-Terphenyl-d14	%	118	118	100

Method ID	Methodology Summary
AS1289.3.6.3	Determination Particle Size Analysis using AS1289.3.6.3 and AS1289.3.6.1 and in house method INORG-107. Clay fraction at <2µm reported.
EXTRACT.7	Toxicity Characteristic Leaching Procedure (TCLP) using Zero Headspace Extraction (zHE) using AS4439 and USEPA 1311.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-004	Toxicity Characteristic Leaching Procedure (TCLP) using in house method INORG-004.
Metals-009	Determination of exchangeable cations and cation exchange capacity in soils using 1M Ammonium Chloride exchange and ICP-AES analytical finish.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS.
Org-012	Leachates are extracted with Dichloromethane and analysed by GC-MS.
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.

QUALITY CONTROL: Misc Inorg - Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			23/05/2018	[NT]	[NT]	[NT]	[NT]	23/05/2018	[NT]
Date analysed	-			23/05/2018	[NT]	[NT]	[NT]	[NT]	23/05/2018	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	[NT]	[NT]	[NT]	[NT]	102	[NT]

QUALITY CONTROL: CEC						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			22/05/2018	19	22/05/2018	22/05/2018		22/05/2018	[NT]
Date analysed	-			22/05/2018	19	22/05/2018	22/05/2018		22/05/2018	[NT]
Exchangeable Ca	meq/100g	0.1	Metals-009	<0.1	19	9.0	8.8	2	99	[NT]
Exchangeable K	meq/100g	0.1	Metals-009	<0.1	19	0.1	0.1	0	109	[NT]
Exchangeable Mg	meq/100g	0.1	Metals-009	<0.1	19	1.2	1.1	9	102	[NT]
Exchangeable Na	meq/100g	0.1	Metals-009	<0.1	19	<0.1	<0.1	0	102	[NT]

QUALITY CONTROL: Metals in TCLP USEPA1311					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	191242-A-3
Date extracted	-			21/05/2018	2	21/05/2018	21/05/2018		21/05/2018	21/05/2018
Date analysed	-			21/05/2018	2	21/05/2018	21/05/2018		21/05/2018	21/05/2018
Arsenic in TCLP	mg/L	0.05	Metals-020 ICP-AES	<0.05	[NT]	[NT]	[NT]	[NT]	100	[NT]
Lead in TCLP	mg/L	0.03	Metals-020 ICP-AES	<0.03	2	0.08	0.08	0	107	106

QUALITY CONTROL: Metals in TCLP USEPA1311					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	15	21/05/2018	21/05/2018		[NT]	[NT]
Date analysed	-			[NT]	15	21/05/2018	21/05/2018		[NT]	[NT]
Lead in TCLP	mg/L	0.03	Metals-020 ICP-AES	[NT]	15	<0.03	<0.03	0	[NT]	[NT]

QUALITY CONTROL: PAHs in TCLP (USEPA 1311)					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			21/05/2018	[NT]	[NT]	[NT]	[NT]	21/05/2018	[NT]
Date analysed	-			21/05/2018	[NT]	[NT]	[NT]	[NT]	21/05/2018	[NT]
Naphthalene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NT]	[NT]	77	[NT]
Acenaphthylene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluorene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NT]	[NT]	86	[NT]
Phenanthrene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NT]	[NT]	85	[NT]
Anthracene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NT]	[NT]	86	[NT]
Pyrene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NT]	[NT]	86	[NT]
Benzo(a)anthracene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NT]	[NT]	80	[NT]
Benzo(bjk)fluoranthene in TCLP	mg/L	0.002	Org-012	<0.002	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NT]	[NT]	82	[NT]
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012	95	[NT]	[NT]	[NT]	[NT]	115	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Report Comments

PAH analysed outside RHT

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Environmental Investigation Services
Attention	Todd Hore

Sample Login Details

Your reference	E30361KH, Ultimo
Envirolab Reference	191242-A
Date Sample Received	10/05/2018
Date Instructions Received	18/05/2018
Date Results Expected to be Reported	25/05/2018

Sample Condition

Samples received in appropriate condition for analysis	YES
No. of Samples Provided	Additional Testing on 13 Soils
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	16.7
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

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12 Ashley St Chatswood NSW 2067
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Sample ID	pH1:5 soil:water	CEC	Clay 50-120g	Metals in TCLP USEPA1311	PAHs in TCLP(USEPA 1311)	On Hold
BH101-0-0.2						✓
BH101-0.5-0.95				✓	✓	
BH101-1.5-1.95				✓	✓	
BH102-0.5-0.95				✓		
BH102-1.5-1.95						✓
BH102-3-3.45	✓	✓	✓	✓		
BH103-0-0.2				✓		
BH103-0.5-0.95				✓		
BH103-1.5-1.95				✓		
BH104-0-0.2						✓
BH104-0.5-0.95						✓
BH104-1.5-1.95						✓
BH104-3-3.45				✓	✓	
BH105-0.5-0.95				✓	✓	
BH105-1.5-1.95				✓	✓	
BH105-3-3.45						✓
BH105-4.5-4.95						✓
BH105-5.7-6.15						✓
BH106-0.5-0.95	✓	✓	✓	✓	✓	
BH106-1.5-1.95						✓
BH106-2.7-3.15						✓
BH107-0.5-0.95				✓	✓	
BH107-1.5-1.95						✓
BH107-2.7-2.9						✓
BH108-0.5-0.95				✓	✓	
BH108-1.5-1.95						✓
BH108-4.2-4.65						✓
DUP1						✓
DUP2						✓
DUP3						✓
TB1						✓
BH105-5.5-5.7						✓

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customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	pH1:5 soil:water	CEC	Clay 50-120g	Metals in TCLP USEPA1311	PAHs in TCLP(USEPA 1311)	On Hold
BH106-2-2.5						✓
BH107-0.31-0.5						✓
BH107-1-1.5						✓
BH107-2.5-2.7						✓
BH108-1-1.5						✓
BH108-2.5-2.7						✓
BH108-4-45						✓
BH102-0-0.2						✓
BH106 - [TRIPLICATE]-2.7-3.15						✓
BH102 - [TRIPLICATE]-3-3.45						✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.

Aileen Hie

From: Todd Hore <THore@jkgroup.net.au>
Sent: Friday, 18 May 2018 8:24 AM
To: Aileen Hie
Subject: 191242

Aileen,
could you please schedule the following additional analyses for the EIS project E30361KH, Ultimo:

- 191242-2 – TCLP lead + PAHs;
- 191242-3 – TCLP lead + PAHs;
- 191242-4 – TCLP lead;
- 191242-6 – TCLP lead, pH, CEC, clay content;
- 191242-7 – TCLP arsenic;
- 191242-8 – TCLP lead;
- 191242-9 – TCLP lead;
- 191242-13 – TCLP lead + PAHs;
- 191242-14 – TCLP lead + PAHs;
- 191242-15 – TCLP lead + PAHs;
- 191242-19 – TCLP PAHs, pH, CEC, clay content;
- 191242-22 – TCLP lead + PAHs;
- 191242-25 – TCLP lead + PAHs;
- ~~191242-2 – TCLP lead + PAHs;~~
- ~~191242-2 – TCLP lead + PAHs;~~

Envirolab Ref: 191242A
Due: 25/5/18
Std TAT.

Please undertake the above on a standard turnaround.

Regards,

Todd Hore
Associate | Environmental Engineer

T: +612 9888 5000
F: +612 9888 5001
THore@jkgroup.net.au
www.jkgroup.net.au

ENVIRONMENTAL INVESTIGATION SERVICES
CONSULTING ENVIRONMENTAL ENGINEERS AND SCIENTISTS
PO Box 976, North Ryde BC NSW 1670
115 Wicks Rd, Macquarie Park NSW 2113

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Envirolab Services Pty Ltd
ABN 37 112 535 645 - 002
1 Dalmore Drive Scoresby VIC 3179
ph 03 9763 2500 fax 03 9763 2633
melbourne@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 13773

Client Details

Client	Environmental Investigation Services
Attention	Todd Hore
Address	PO Box 976, North Ryde BC, NSW, 1670

Sample Details

Your Reference	**E30361KH**
Number of Samples	1 Soil
Date samples received	15/05/2018
Date completed instructions received	15/05/2018

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	22/05/2018
Date of Issue	22/05/2018

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Results Approved By
Chris De Luca, Senior Chemist
Pamela Adams, Laboratory Manager, Melbourne

Authorised By

Pamela Adams, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil		
Our Reference		13773-1
Your Reference	UNITS	Dup 4
Date Sampled		08/05/2018
Type of sample		Soil
Date extracted	-	18/05/2018
Date analysed	-	18/05/2018
vTRH C_6 - C_9	mg/kg	<25
vTRH C_6 - C_{10}	mg/kg	<25
TRH C_6 - C_{10} less BTEX (F1)	mg/kg	<25
Benzene	mg/kg	<0.2
Toluene	mg/kg	<0.5
Ethylbenzene	mg/kg	<1
m+p-xylene	mg/kg	<2
o-Xylene	mg/kg	<1
Naphthalene	mg/kg	<1
Total +ve Xylenes	mg/kg	<1
Surrogate aaa-Trifluorotoluene	%	87

TRH Soil C10-C40 NEPM		
Our Reference		13773-1
Your Reference	UNITS	Dup 4
Date Sampled		08/05/2018
Type of sample		Soil
Date extracted	-	18/05/2018
Date analysed	-	21/05/2018
TRH C_{10} - C_{14}	mg/kg	<50
TRH C_{15} - C_{28}	mg/kg	<100
TRH C_{29} - C_{36}	mg/kg	<100
Total +ve TRH (C10-C36)	mg/kg	<50
TRH >C_{10} -C_{16}	mg/kg	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50
TRH >C_{16} -C_{34}	mg/kg	120
TRH >C_{34} -C_{40}	mg/kg	<100
Total +ve TRH (>C10-C40)	mg/kg	120
Surrogate o-Terphenyl	%	102

PAHs in Soil		
Our Reference		13773-1
Your Reference	UNITS	Dup 4
Date Sampled		08/05/2018
Type of sample		Soil
Date extracted	-	18/05/2018
Date analysed	-	22/05/2018
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	0.8
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	0.5
Phenanthrene	mg/kg	5.0
Anthracene	mg/kg	1.4
Fluoranthene	mg/kg	6.6
Pyrene	mg/kg	6.4
Benzo(a)anthracene	mg/kg	3.0
Chrysene	mg/kg	2.4
Benzo(b,j&k)fluoranthene	mg/kg	3.6
Benzo(a)pyrene	mg/kg	2.4
Indeno(1,2,3-c,d)pyrene	mg/kg	1.2
Dibenzo(a,h)anthracene	mg/kg	0.3
Benzo(g,h,i)perylene	mg/kg	1.3
Total +ve PAH's	mg/kg	35
Benzo(a)pyrene TEQ calc (Zero)	mg/kg	3.6
Benzo(a)pyrene TEQ calc (Half)	mg/kg	3.6
Benzo(a)pyrene TEQ calc (PQL)	mg/kg	3.6
Surrogate p-Terphenyl-d_{14}	%	96

Acid Extractable metals in soil		
Our Reference		13773-1
Your Reference	UNITS	Dup 4
Date Sampled		08/05/2018
Type of sample		Soil
Date digested	-	21/05/2018
Date analysed	-	21/05/2018
Arsenic	mg/kg	<4
Cadmium	mg/kg	<0.4
Chromium	mg/kg	11
Copper	mg/kg	15
Lead	mg/kg	45
Mercury	mg/kg	<0.1
Nickel	mg/kg	7
Zinc	mg/kg	68

Moisture		
Our Reference		13773-1
Your Reference	UNITS	Dup 4
Date Sampled		08/05/2018
Type of sample		Soil
Date prepared	-	18/05/2018
Date analysed	-	21/05/2018
Moisture	%	8.7

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105 deg C for a minimum of 12 hours.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			18/05/2018	[NT]	[NT]	[NT]	[NT]	18/05/2018	[NT]
Date analysed	-			18/05/2018	[NT]	[NT]	[NT]	[NT]	18/05/2018	[NT]
vTRH C_6 - C_9	mg/kg	25	Org-016	<25	[NT]	[NT]	[NT]	[NT]	84	[NT]
vTRH C_6 - C_{10}	mg/kg	25	Org-016	<25	[NT]	[NT]	[NT]	[NT]	84	[NT]
Benzene	mg/kg	0.2	Org-016	<0.2	[NT]	[NT]	[NT]	[NT]	80	[NT]
Toluene	mg/kg	0.5	Org-016	<0.5	[NT]	[NT]	[NT]	[NT]	87	[NT]
Ethylbenzene	mg/kg	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	86	[NT]
m+p-xylene	mg/kg	2	Org-016	<2	[NT]	[NT]	[NT]	[NT]	84	[NT]
o-Xylene	mg/kg	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	83	[NT]
Naphthalene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	90	[NT]	[NT]	[NT]	[NT]	92	[NT]

QUALITY CONTROL: TRH Soil C10-C40 NEPM					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			18/05/2018	[NT]	[NT]	[NT]	[NT]	18/05/2018	[NT]
Date analysed	-			21/05/2018	[NT]	[NT]	[NT]	[NT]	21/05/2018	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-003	<50	[NT]	[NT]	[NT]	[NT]	95	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	76	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	80	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	<50	[NT]	[NT]	[NT]	[NT]	95	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	76	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	80	[NT]
Surrogate o-Terphenyl	%		Org-003	81	[NT]	[NT]	[NT]	[NT]	78	[NT]

QUALITY CONTROL: PAHs in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			18/05/2018	[NT]	[NT]	[NT]	[NT]	18/05/2018	[NT]
Date analysed	-			22/05/2018	[NT]	[NT]	[NT]	[NT]	22/05/2018	[NT]
Naphthalene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	92	[NT]
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	96	[NT]
Phenanthrene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	96	[NT]
Anthracene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	84	[NT]
Pyrene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	88	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	96	[NT]
Benzo(b,j&k)fluoranthene	mg/kg	0.2	Org-012	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	[NT]	[NT]	[NT]	[NT]	88	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d_{14}	%		Org-012	92	[NT]	[NT]	[NT]	[NT]	96	[NT]

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date digested	-			21/05/2018	[NT]	[NT]	[NT]	[NT]	21/05/2018	[NT]
Date analysed	-			21/05/2018	[NT]	[NT]	[NT]	[NT]	21/05/2018	[NT]
Arsenic	mg/kg	4	Metals-020 ICP-AES	<4	[NT]	[NT]	[NT]	[NT]	92	[NT]
Cadmium	mg/kg	0.4	Metals-020 ICP-AES	<0.4	[NT]	[NT]	[NT]	[NT]	98	[NT]
Chromium	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	[NT]	[NT]	99	[NT]
Copper	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	[NT]	[NT]	94	[NT]
Lead	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	[NT]	[NT]	95	[NT]
Mercury	mg/kg	0.1	Metals-021 CV-AAS	<0.1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Nickel	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	[NT]	[NT]	97	[NT]
Zinc	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	[NT]	[NT]	95	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Envirolab Services Pty Ltd
ABN 37 112 535 645 - 002
1 Dalmore Drive Scoresby VIC 3179
ph 03 9763 2500 fax 03 9763 2633
melbourne@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Environmental Investigation Services
Attention	Todd Hore

Sample Login Details

Your reference	E30361KH
Envirolab Reference	13773
Date Sample Received	15/05/2018
Date Instructions Received	15/05/2018
Date Results Expected to be Reported	22/05/2018

Sample Condition

Samples received in appropriate condition for analysis	YES
No. of Samples Provided	1 Soil
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	14
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Pamela Adams	Analisa Mathrick
Phone: 03 9763 2500	**Phone: 03 9763 2500**
Fax: 03 9763 2633	**Fax: 03 9763 2633**
Email: padams@envirolab.com.au	**Email: amathrick@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645 - 002
1 Dalmore Drive Scoresby VIC 3179
ph 03 9763 2500 fax 03 9763 2633
melbourne@envirolab.com.au
www.envirolab.com.au

Sample ID	vTRH(C6-C10)/BTEXN in Soil	TRH Soil C10-C40 NEPM	PAHs in Soil	Acid Extractable metalsin soil
Dup 4	✓	✓	✓	✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.

SAMPLE AND CHAIN OF CUSTODY FORM

TO:
ENVIROLAB SERVICES PTY LTD
12 ASHLEY STREET
CHATSWOOD NSW 2067
P: (02) 99106200
F: (02) 99106201

Attention: Aileen

EIS Job Number: E30361KH

Date Results Required: STANDARD

Page: 2

FROM: EIS
ENVIRONMENTAL INVESTIGATION SERVICES
REAR OF 115 WICKS ROAD
MACQUARIE PARK, NSW 2113
P: 02-9888 5000 F: 02-9888 5001
Attention: Todd Hore

Location: Ultimo
Sampler: TC

Sample Preserved in Esky on Ice

Tests Required

Date Sampled	Lab Ref:	Sample Number	Depth (m)	Sample Container	PID	Sample Description	Combo 2	Combo 3a	Combo 3	Combo 6a	8 Metals	PAHs	TRH/BTEX	BTEX	Asbestos	sPOCAS		
08-05-18	22	BH107	0.5-0.95	G, A	0	Fill: clayey sand		X										
08-05-18	23	BH107	1.5-1.95	G, A	0	Fill: clayey sand		X										
08-05-18	24	BH107	2.7-2.9	G	0	Silty sand		X										
08-05-18	25	BH108	0.5-0.95	G, A	0	Fill: sandy clay		X										
08-05-18	26	BH108	1.5-1.95	G, A	0	Fill: silty sand		X										
N/R 08-05-18	[illegible]	BH108	3-3.45	G, A	0	Fill: sandy clay												
27 08-05-18	[illegible]	BH108	4.2-4.65	G, A	0	Sandy clay		X										
28 03-05-18	[illegible]	Dup 1		G	0	Soil			X									
29 03-05-18	[illegible]	Dup 2		G	0	Soil			X									
30 08-05-18	[illegible]	Dup 3		G	0	Soil			X									
08-05-18	[illegible]	Dup 4		G	0	Soil			X									
31 07-05-18	[illegible]	TB1		G	—	Soil								X				
32 07-05-18	[illegible]	BH105	5.5-5.7	P	—	Fill: sandy clay										X		
33 07-05-18	[illegible]	BH106	2-2.5	P	—	Fill: sandy clay										X		
34 08-05-18	[illegible]	BH107	0.31-0.5	P	—	Fill: silty clay												
35 08-05-18	[illegible]	BH107	1-1.5	P	—	Fill: silty sand										X		
36 08-05-18	[illegible]	BH107	2.5-2.7	P	—	Fill: clayey sand										X		
37 08-05-18	[illegible]	BH108	1-1.5	P	—	Fill: silty sand												
38 08-05-18	[illegible]	BH108	2.5-2.7	P	—	Fill: sandy clay										X		
39 08-05-18	[illegible]	BH108	4-4.5	P	—	Sandy clay										X		

ENVIROLAB
Job No: 13773
Date Received: 15/5/18
Time Received: 10:40
Received by: [illegible]
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

14.2°C

Envirolab Services
12a Dalmore Drive
Scoresby VIC 3179
Ph: (03) 9763 2500

Remarks (comments/detection limits required):
Please send Dup 4 as inter-lab Dup to Melbourne

Sample Containers:
G - 250mg Glass Jar
A - Ziplock Asbestos Bag
P - Plastic Bag

Relinquished By:	Date:	Time:	Received By:	Date:
[illegible] / ZLS Kevin Wong	9/5/18	2:30pm	ELS	10/5

14/5/18

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 191242-B

Client Details

Client	Environmental Investigation Services
Attention	Todd Hore
Address	PO Box 976, North Ryde BC, NSW, 1670

Sample Details

Your Reference	**E30361KH, Ultimo**
Number of Samples	40 soil
Date samples received	10/05/2018
Date completed instructions received	29/05/2018

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	30/05/2018
Date of Issue	30/05/2018

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Matt Mansfield, Development Chemist

Authorised By

Jacinta Hurst, Laboratory Manager

SCr		
Our Reference		191242-B-32
Your Reference	UNITS	BH105
Depth		5.5-5.7
Date Sampled		03/05/2018
Type of sample		soil
Date prepared	-	30/05/2018
Date analysed	-	30/05/2018
Chromium Reducible Sulfur	%w/w	0.11
a-Chromium Reducible Sulfur	moles H^+ /t	71

Method ID	Methodology Summary
Inorg-068	Chromium Reducible Sulfur - Hydrogen Sulfide is quantified by iodometric titration after distillation to determine potential acidity. Based on Acid Sulfate Soils Laboratory Methods Guidelines, Version 2.1 - June 2004.

QUALITY CONTROL: SCr						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			30/05/2018	[NT]	[NT]	[NT]	[NT]	30/05/2018	[NT]
Date analysed	-			30/05/2018	[NT]	[NT]	[NT]	[NT]	30/05/2018	[NT]
Chromium Reducible Sulfur	%w/w	0.005	Inorg-068	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
a-Chromium Reducible Sulfur	moles H^+ /t	3	Inorg-068	<3	[NT]	[NT]	[NT]	[NT]	95	[NT]

Result Definitions

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Measurement Uncertainty estimates are available for most tests upon request.

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customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Environmental Investigation Services
Attention	Todd Hore

Sample Login Details

Your reference	E30361KH, Ultimo
Envirolab Reference	191242-B
Date Sample Received	10/05/2018
Date Instructions Received	29/05/2018
Date Results Expected to be Reported	30/05/2018

Sample Condition

Samples received in appropriate condition for analysis	YES
No. of Samples Provided	40 soil
Turnaround Time Requested	1 day
Temperature on Receipt (°C)	16.7
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	SCr	On Hold
BH101-0-0.2		✓
BH101-0.5-0.95		✓
BH101-1.5-1.95		✓
BH102-0.5-0.95		✓
BH102-1.5-1.95		✓
BH102-3-3.45		✓
BH103-0-0.2		✓
BH103-0.5-0.95		✓
BH103-1.5-1.95		✓
BH104-0-0.2		✓
BH104-0.5-0.95		✓
BH104-1.5-1.95		✓
BH104-3-3.45		✓
BH105-0.5-0.95		✓
BH105-1.5-1.95		✓
BH105-3-3.45		✓
BH105-4.5-4.95		✓
BH105-5.7-6.15		✓
BH106-0.5-0.95		✓
BH106-1.5-1.95		✓
BH106-2.7-3.15		✓
BH107-0.5-0.95		✓
BH107-1.5-1.95		✓
BH107-2.7-2.9		✓
BH108-0.5-0.95		✓
BH108-1.5-1.95		✓
BH108-4.2-4.65		✓
DUP1		✓
DUP2		✓
DUP3		✓
TB1		✓
BH105-5.5-5.7	✓	

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	SCr	On Hold
BH106-2-2.5		✓
BH107-0.31-0.5		✓
BH107-1-1.5		✓
BH107-2.5-2.7		✓
BH108-1-1.5		✓
BH108-2.5-2.7		✓
BH108-4-45		✓
BH102-0-0.2		✓
BH106 - [TRIPLICATE]-2.7-3.15		✓
BH102 - [TRIPLICATE]-3-3.45		✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.

Andrew Fitzsimons

From: Aileen Hie
Sent: Tuesday, 29 May 2018 4:06 PM
To: Andrew Fitzsimons
Subject: FW: 191242

ELS: 191242-B
TAT: 1 day
Due: 30/5/18

Regards,

Aileen Hie | Sample Receipt Supervisor | Envirolab Services Pty Ltd

Great Science, Great Service.

12 Ashley Street Chatswood NSW 2067
T 612 9910 6200 **F** 612 9910 6201
E ahie@envirolab.com.au | **W** www.envirolab.com.au

Please note that all samples submitted to the Envirolab Group laboratories will be analysed under the Envirolab Group Terms and Conditions. The Terms and Conditions are accessible by clicking this link

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From: Todd Hore [mailto:THore@jkgroup.net.au]
Sent: Tuesday, 29 May 2018 3:09 PM
To: Aileen Hie <AHie@envirolab.com.au>
Subject: 191242

Hi Aileen,
Can you please schedule additional analysis on one sample from the EIS job E30361KH, Ultimo:

- 191242-32 – Chromium reducible sulphur.

Can you please do this on a fast turnaround (fastest possible).

Regards,

Todd Hore
Associate | Environmental Engineer

T: +612 9888 5000
F: +612 9888 5001
THore@jkgroup.net.au
www.jkgroup.net.au

Appendix D: Report Explanatory Notes

STANDARD SAMPLING PROCEDURE

These protocols specify the basic procedures to be used when sampling soils or groundwater for environmental site assessments undertaken by EIS. The purpose of these protocols is to provide standard methods for: sampling, decontamination procedures for sampling equipment, sample preservation, sample storage and sample handling. Deviations from these procedures must be recorded.

Soil Sampling

- Prepare a borehole/test pit log or made a note of the sample description for stockpiles.
- Layout sampling equipment on clean plastic sheeting to prevent direct contact with ground surface. The work area should be at a distance from the drill rig/excavator such that the machine can operate in a safe manner.
- Ensure all sampling equipment has been decontaminated prior to use.
- Remove any surface debris from the immediate area of the sampling location.
- Collect samples and place in glass jar with a Teflon seal. This should be undertaken as quickly as possible to prevent the loss of any volatiles. If possible, fill the glass jars completely.
- Collect samples for asbestos analysis and place in a zip-lock plastic bag.
- Label the sampling containers with the EIS job number, sample location (eg. BH1), sampling depth interval and date. If more than one sample container is used, this should also be indicated (eg. 2 = Sample jar 1 of 2 jars).
- Photoionisation detector (PID) screening of volatile organic compounds (VOCs) should be undertaken on samples using the soil sample headspace method. Headspace measurements are taken following equilibration of the headspace gasses in partly filled zip-lock plastic bags. PID headspace data is recorded on the borehole/test pit log and the chain of custody forms.
- Record the lithology of the sample and sample depth on the borehole/test pit log generally in accordance with AS1726-1993[22].
- Store the sample in a sample container cooled with ice or chill packs. On completion of the sampling the sample container should be delivered to the lab immediately or stored in the refrigerator prior to delivery to the lab. All samples are preserved in accordance with the standards outlined in the report.
- Check for the presence of groundwater after completion of each borehole using an electronic dip metre or water whistle. Boreholes should be left open until the end of fieldwork where it is safe to do so. All groundwater levels in the boreholes should be rechecked on the completion of the fieldwork.
- Backfill the boreholes/test pits with the excavation cuttings or clean sand prior to leaving the site.

Decontamination Procedures for Soil Sampling Equipment

- All sampling equipment should be decontaminated between every sampling location. This excludes single use PVC tubing used for push tubes etc. Equipment and materials required for the decontamination include:
  - Phosphate free detergent (Decon 90);
  - Potable water;
  - Stiff brushes; and
  - Plastic sheets.
- Ensure the decontamination materials are clean prior to proceeding with the decontamination.
- Fill both buckets with clean potable water and add phosphate free detergent to one bucket.

[22] Standards Australia, (1993), *Geotechnical Site Investigations.* (AS1726-1993)

- In the bucket containing the detergent, scrub the sampling equipment until all the material attached to the equipment has been removed.
- Rinse sampling equipment in the bucket containing potable water.
- Place cleaned equipment on clean plastic sheets.

If all materials are not removed by this procedure, high-pressure water cleaning is recommended. If any equipment is not completely decontaminated by both these processes, then the equipment should not be used until it has been thoroughly cleaned.

Groundwater Sampling

Groundwater samples are more sensitive to contamination than soil samples and therefore adhesion to this protocol is particularly important to obtain reliable, reproducible results. The recommendations detailed in AS/NZS 5667.1:1998 are considered to form a minimum standard.

The basis of this protocol is to maintain the security of the borehole and obtain accurate and representative groundwater samples. The following procedure should be used for collection of groundwater samples from previously installed groundwater monitoring wells.

- After monitoring well installation, at least three bore volumes should be pumped from the monitoring wells (well development) to remove any water introduced during the drilling process and/or the water that is disturbed during installation of the monitoring well. This should be completed prior to purging and sampling.
- Groundwater monitoring wells should then be left to recharge for at least three days before purging and sampling. Prior to purging or sampling, the condition of each well should observed and any anomalies recorded on the field data sheets. The following information should be noted: the condition of the well, noting any signs of damage, tampering or complete destruction; the condition and operation of the well lock; the condition of the protective casing and the cement footing (raised or cracked); and, the presence of water between protective casing and well.
- Measure the groundwater level from the collar of the piezometer/monitoring well using an electronic dip meter. The collar level should be taken (if required) during the site visit using a dumpy level and staff.
- Purging and sampling of piezometers/monitoring wells is done on the same site visit when using micro-purge (or other low flow) techniques.
- Layout and organize all equipment associated with groundwater sampling in a location where they will not interfere with the sampling procedure and will not pose a risk of contaminating samples. Equipment generally required includes:
  - Stericup single-use filters (for heavy metals samples);
  - Bucket with volume increments;
  - Sample containers: teflon bottles with 1 ml nitric acid, 75mL glass vials with 1 mL hydrochloric acid, 1 L amber glass bottles;
  - Bucket with volume increments;
  - Flow cell;
  - pH/EC/Eh/Temperature meters;
  - Plastic drums used for transportation of purged water;
  - Esky and ice;
  - Nitrile gloves;
  - Distilled water (for cleaning);
  - Electronic dip meter;
  - Low flow peristaltic pump and associated tubing; and
  - Groundwater sampling forms.

- Ensure all non-disposable sampling equipment is decontaminated or that new disposable equipment is available prior to any work commencing at a new location. The procedure for decontamination of groundwater equipment is outlined at the end of this section.
- Disposable gloves should be used whenever samples are taken to protect the sampler and to assist in avoidance of contamination.
- Groundwater samples are obtained from the monitoring wells using low flow sampling equipment to reduce the disturbance of the water column and loss of volatiles.
- During pumping to purge the well, the pH, temperature, conductivity, dissolved oxygen, redox potential and groundwater levels are monitored (where possible) using calibrated field instruments to assess the development of steady state conditions. Steady state conditions are generally considered to have been achieved when the difference in the pH measurements was less than 0.2 units and the difference in conductivity was less than 10%.
- All measurements are recorded on specific data sheets.
- Once steady state conditions are considered to have been achieved, groundwater samples are obtained directly from the pump tubing and placed in appropriate glass bottles, BTEX vials or plastic bottles.
- All samples are preserved in accordance with water sampling requirements specified by the laboratory and placed in an insulated container with ice. Groundwater samples are preserved by immediate storage in an insulated sample container with ice.
- At the end of each water sampling complete a chain of custody form for samples being sent to the laboratory.

Decontamination Procedures for Groundwater Sampling Equipment

- All equipment associated with the groundwater sampling procedure (other than single-use items) should be decontaminated between every sampling location.
- The following equipment and materials are required for the decontamination procedure:
  - Phosphate free detergent;
  - Potable water;
  - Distilled water; and
  - Plastic Sheets or bulk bags (plastic bags).
- Fill one bucket with clean potable water and phosphate free detergent, and one bucket with distilled water.
- Flush potable water and detergent through pump head. Wash sampling equipment and pump head using brushes in the bucket containing detergent until all materials attached to the equipment are removed.
- Flush pump head with distilled water.
- Change water and detergent solution after each sampling location.
- Rinse sampling equipment in the bucket containing distilled water.
- Place cleaned equipment on clean plastic sheets.
- If all materials are not removed by this procedure that equipment should not be used until it has been thoroughly cleaned

QA/QC DEFINITIONS

The QA/QC terms used in this report are defined below. The definitions are in accordance with US EPA publication SW-846, entitled *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (1994)[23] methods and those described in *Environmental Sampling and Analysis, A Practical Guide,* (1991)[24].

Practical Quantitation Limit (PQL), Limit of Reporting (LOR) & Estimated Quantitation Limit (EQL)

These terms all refer to the concentration above which results can be expressed with a minimum 95% confidence level. The laboratory reporting limits are generally set at ten times the standard deviation for the Method Detection Limit for each specific analyte. For the purposes of this report the LOR, PQL, and EQL are considered to be equivalent.

When assessing laboratory data it should be borne in mind that values at or near the PQL have two important limitations: *"The uncertainty of the measurement value can approach, and even equal, the reported value. Secondly, confirmation of the analytes reported is virtually impossible unless identification uses highly selective methods. These issues diminish when reliably measurable amounts of analytes are present. Accordingly, legal and regulatory actions should be limited to data at or above the reliable detection limit*" (Keith, 1991).

Precision

The degree to which data generated from repeated measurements differ from one another due to random errors. Precision is measured using the standard deviation or Relative Percent Difference (RPD).

Accuracy

Accuracy is a measure of the agreement between an experimental result and the true value of the parameter being measured (i.e. the proximity of an averaged result to the true value, where all random errors have been statistically removed). The assessment of accuracy for an analysis can be achieved through the analysis of known reference materials or assessed by the analysis of surrogates, field blanks, trip spikes and matrix spikes. Accuracy is typically reported as percent recovery.

Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is primarily dependent upon the design and implementation of the sampling program. Representativeness of the data is partially ensured by the avoidance of contamination, adherence to sample handing and analysis protocols and use of proper chain-of-custody and documentation procedures.

Completeness

Completeness is a measure of the number of valid measurements in a data set compared to the total number of measurements made and overall performance against DQIs. The following information is assessed for completeness:

- Chain-of-custody forms;
- Sample receipt form;
- All sample results reported;

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[23] US EPA, (1994). *SW-846: Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.* (US EPA SW-846)

[24] Keith., H, (1991). *Environmental Sampling and Analysis, A Practical Guide.*

- All blank data reported;
- All laboratory duplicate and RPDs calculated;
- All surrogate spike data reported;
- All matrix spike and lab control spike (LCS) data reported and RPDs calculated;
- Spike recovery acceptable limits reported; and
- NATA stamp on reports.

Comparability

Comparability is the evaluation of the similarity of conditions (e.g. sample depth, sample homogeneity) under which separate sets of data are produced. Data comparability checks include a bias assessment that may arise from the following sources:

- Collection and analysis of samples by different personnel; Use of different techniques;
- Collection and analysis by the same personnel using the same methods but at different times; and
- Spatial and temporal changes (due to environmental dynamics).

Blanks

The purpose of laboratory and field blanks is to check for artefacts and interferences that may arise during sampling, transport and analysis.

Matrix Spikes

Samples are spiked with laboratory grade standards to detect interactive effects between the sample matrix and the analytes being measured. Matrix Spikes are reported as a percent recovery and are prepared for 1 in every 20 samples. Sample batches that contain less than 20 samples may be reported with a Matrix Spike from another batch. The percent recovery is calculated using the formula below. Acceptable recovery limits are 70% to 130%.

$$\frac{\text{(Spike Sample Result – Sample Result) x 100}}{\text{Concentration of Spike Added}}$$

Surrogate Spikes

Samples are spiked with a known concentration of compounds that are chemically related to the analyte being investigated but unlikely to be detected in the environment. The purpose of the Surrogate Spikes is to check the accuracy of the analytical technique. Surrogate Spikes are reported as percent recovery.

Duplicates

Laboratory duplicates measure precision, expressed as Relative Percent Difference. Duplicates are prepared from a single field sample and analysed as two separate extraction procedures in the laboratory. The RPD is calculated using the formula where D1 is the sample concentration and D2 is the duplicate sample concentration:

$$\frac{\text{(D1 – D2) x 100}}{\text{\{(D1 + D2)/2\}}}$$

SCREENING CRITERIA DEFINITIONS

The following definitions have been adopted based on Schedule B(1) of NEPM (2013) and are relevant to Tier 1 screening criteria adopted for contamination assessments.

Health investigation levels (HILs) have been developed for a broad range of metals and organic substances. The HILs are applicable for assessing human health risk via all relevant pathways of exposure. The HILs are generic to all soil types and apply generally to a depth of 3 m below the surface for residential use. Site-specific conditions should determine the depth to which HILs apply for other land uses.

Health screening levels (HSLs) have been developed for selected petroleum compounds and fractions and are applicable to assessing human health risk via the inhalation and direct contact pathways. The HSLs depend on specific soil physicochemical properties, land use scenarios, and the characteristics of building structures. They apply to different soil types, and depths below surface to >4 m. HSLs have also been developed for asbestos and apply to the top 3m of soil.

Ecological investigation levels (EILs) have been developed for selected metals and organic substances and are applicable for assessing risk to terrestrial ecosystems. EILs depend on specific soil physicochemical properties and land use scenarios and generally apply to the top 2 m of soil.

Ecological screening levels (ESLs) have been developed for selected petroleum hydrocarbon compounds and total petroleum/recoverable hydrocarbon (TPH/TRH) fractions and are applicable for assessing risk to terrestrial ecosystems. ESLs broadly apply to coarse- and fine-grained soils and various land uses. They are generally applicable to the top 2 m of soil.

Groundwater investigation levels (GILs) are the concentrations of a contaminant in groundwater above which further investigation (point of extraction) or a response (point of use) is required. GILs are based on Australian water quality guidelines and drinking water guidelines and are applicable for assessing human health risk and ecological risk from direct contact (including consumption) with groundwater.

Management Limits for Petroleum hydrocarbons are applicable to petroleum hydrocarbon compounds only. They are applicable as screening levels following evaluation of human health and ecological risks and risks to groundwater resources. They are relevant for operating sites where significant sub-surface leakage of petroleum compounds has occurred and when decommissioning industrial and commercial sites.

Interim soil vapour health investigation levels (interim HILs) have been developed for selected volatile organic chlorinated compounds (VOCCs) and are applicable to assessing human health risk by the inhalational pathway. They have interim status pending further scientific work on volatile gas modelling from the sub-surface to building interiors for chlorinated compounds.

Appendix E: Data (QA/QC) Evaluation

DATA (QA/QC) EVALUATION

INTRODUCTION

This Data (QA/QC) Evaluation forms part of the validation process for the DQOs documented in Section 5.1 of this report. Checks were made to assess the data in terms of precision, accuracy, representativeness, comparability and completeness. These 'PARCC' parameters are referred to collectively as DQIs and are defined in the Report Explanatory Notes attached in the report appendices.

Field and Laboratory Considerations

The quality of the analytical data produced for this project has been considered in relation to the following:

- Sample collection, storage, transport and analysis;
- Laboratory PQLs;
- Field QA/QC results; and
- Laboratory QA/QC results.

Field QA/QC Samples and Analysis

A summary of the field QA/QC samples collected and analysed for this assessment is provided in the following table:

Sample Type	Sample Identification	Frequency (of Sample Type)	Analysis Performed
Intra-laboratory duplicate (soil)	Dup 1 (primary sample BH101 0-0.2m) Dup 2 (primary sample BH102 0-0.2m) Dup 3 (primary sample BH107 0.5-0.95m)	Approximately 12.5% of primary samples	Heavy metals, TRH/BTEX and PAHs
Inter-laboratory duplicate (soil)	Dup 4 (primary sample BH108 0.5-0.95m)	Approximately 4% of primary samples	Heavy metals, TRH/BTEX, PAHs
Trip blank (soil)	TB1 (7 May 2018)	One for the assessment to demonstrate adequacy of storage and transport methods	BTEX

The results for the field QA/QC samples are detailed in the laboratory summary tables (Table G to Table I inclusive) attached to the assessment report and are discussed in the subsequent sections of this Data (QA/QC) Evaluation report.

Data Assessment Criteria

EIS adopted the following criteria for assessing the field and laboratory QA/QC analytical results:

Field Duplicates

Acceptable targets for precision of field duplicates in this report will be less than 50% RPD for concentrations greater than 10 times the PQL, less than 75% RPD for concentrations between five and 10 times the PQL and less than 100% RPD for concentrations that are less than five times the PQL. RPD failures will be considered qualitatively on a case-by-case basis taking into account factors such as the sample type, collection methods and the specific analyte where the RPD exceedance was reported.

Field Blanks

Acceptable targets for field blank samples in this report will be less than the PQL for organic analytes.

Laboratory QA/QC

The suitability of the laboratory data is assessed against the laboratory QA/QC criteria which is outlined in the laboratory reports. These criteria were developed and implemented in accordance with the laboratory's NATA accreditation and align with the acceptable limits for QA/QC samples as outlined in NEPM (2013) and other relevant guidelines.

A summary of the acceptable limits adopted by the primary laboratory (Envirolab) is provided below:

RPDs

- Results that are <5 times the PQL, any RPD is acceptable; and
- Results >5 times the PQL, RPDs between 0-50% are acceptable.

Laboratory Control Samples (LCS) and Matrix Spikes

- 70-130% recovery acceptable for metals and inorganics;
- 60-140% recovery acceptable for organics; and
- 10-140% recovery acceptable for VOCs.

Surrogate Spikes

- 60-140% recovery acceptable for general organics; and
- 10-140% recovery acceptable for VOCs.

Method Blanks

- All results less than PQL.

DATA EVALUATION

Sample Collection, Storage, Transport and Analysis

Samples were collected by trained field staff in accordance with the EIS SSP. The SSP was developed to be consistent with relevant guidelines, including NEPM (2013) and other guidelines made under the CLM Act 1997.

Appropriate sample preservation, handling and storage procedures were adopted. Laboratory analysis was undertaken within specified holding times in accordance with Schedule B(3) of NEPM (2013) and the laboratory NATA accredited methodologies.

Review of the project data also indicated that:

- COC documentation was adequately maintained;
- Sample receipt advice documentation was provided for all sample batches;
- All analytical results were reported; and
- Consistent units were used to report the analysis results.

Laboratory PQLs

Appropriate PQLs were adopted for the analysis and all PQLs were below the SAC.

Field QA/QC Sample Results

Field Duplicates

The results indicated that field precision was acceptable. RPD non-conformances were reported for some analytes as discussed below:

- Elevated RPDs were reported for several heavy metals and PAH compounds in Dup 1/BH101 (0-0.2m) and Dup 3/BH107 (0.5-0.95m);
- An elevated RPD was reported for TRH F3 in Dup 3/BH107 (0.5-0.95m); and
- Elevated RPDs were reported for several heavy metals and PAH compounds in Dup 4/BH108 (0.5-0.95m).

Generally the results of both primary and duplicate samples were less than the SAC. The exception was carcinogenic PAHS in Dup 3/BH107 (0.5-0.95m), where both results were above the SAC.

Values outside the acceptable limits have been attributed to sample heterogeneity and the difficulties associated with obtaining homogenous duplicate samples of heterogeneous matrices. As both the primary and duplicate sample results were either both less than the SAC or both greater than the SAC, the exceedances are not considered to have had an adverse impact on the data set as a whole.

Field Blanks

During the investigation, one soil trip blank was placed in the esky during sampling and transported back to the laboratory. The results were all less than the PQLs, therefore cross contamination between samples that may have significance for data validity did not occur.

Laboratory QA/QC

The analytical methods implemented by the laboratory were performed in accordance with their NATA accreditation and were consistent with Schedule B(3) of NEPM (2013). The frequency of data reported for the laboratory QA/QC (i.e. duplicates, spikes, blanks, LCS) was considered to be acceptable for the purpose of this assessment.

A review of the laboratory QA/QC data identified the following minor non-conformances:

- Percent recovery in some matrix spikes for TRH and PAHs were not reported as the high concentration of analytes in the sample/s have cause interference;
- The laboratory RPD criteria was exceeded for two samples for heavy metals. A triplicate was issued for each sample; and
- Percent recovery in some matrix spikes for heavy metals were not reported as the high concentration of analytes in the sample caused interference, however an acceptable recovery was obtained for the LCS.

The non-conformances are considered to be minor and do not compromise the data quality.

DATA QUALITY SUMMARY

EIS are of the opinion that the data are adequately precise, accurate, representative, comparable and complete to serve as a basis for interpretation to achieve the investigation objectives.

Non-conformances were reported for some field QA/QC samples and laboratory QA/QC analysis. These non-conformances were considered to be sporadic and minor, and were not considered to be indicative of systematic sampling or analytical errors. On this basis, these non-conformances are not considered to materially impact the report findings.

Appendix F: Field Work Documents

ENVIRONMENTAL INVESTIGATION SERVICES

CONSULTING ENVIRONMENTAL ENGINEERS

EIS

Client:	DESIGNINC SYDNEY PTY LTD	**Job No.:**	E30361KH
Project:	Proposed Redevelopment of Ultimo Public School	**Well No.:**	MW104
Location:	ULTIMO PUBLIC SCHOOL, 189 JONES STREET, ULTIMO, NSW	**Depth (m):**	6.450

WELL FINISH DETAILS

	Gatic Cover ☑	**Standpipe** ☐	**Other (describe)** ☐

WELL DEVELOPMENT DETAILS

Method:	Development	**SWL – Before (m):**	6.160
Date:	9/5/18	**Time – Before:**	11:20am
Undertaken By:	AL/HW	**SWL – After (m):**	Dry
Total Vol. Removed:	1.0	**Time – After:**	11:32am
PID Reading (ppm):	42.50		

Comments:

DEVELOPMENT MEASUREMENTS

Volume Removed (L)	Temp (°C)	DO (mg/L)	EC (µS/m)	pH	Eh (mV)
1	23.3	6.9	474.3	8.41	154.7
Dry, slow recharge					

Comments: Odours (YES / (NO)), NAPL/PSH (YES / (NO)), Sheen (YES / (NO)), Steady State Achieved (YES / (NO))

Well dry

Tested By:	
Date Tested:	
Checked By:	
Date:	

Remarks:

- All measurements are corrected to ground level
- All stated Volumes are in Litres
- SWL is an abbreviation for standing water level
- Steady state conditions - difference in the pH less than 0.2 units and difference in conductivity less than 10%
- Minimum 3 monitoring well volumes are purged

ENVIRONMENTAL INVESTIGATION SERVICES

CONSULTING ENVIRONMENTAL ENGINEERS

EIS

Client:	DESIGNINC SYDNEY PTY LTD	**Job No.:**	E30361KH
Project:	Proposed Redevelopment of Ultimo Public School	**Well No.:**	MW106
Location:	ULTIMO PUBLIC SCHOOL, 189 JONES STREET, ULTIMO, NSW	**Depth (m):**	6.10

WELL FINISH DETAILS

	Gatic Cover ☑	**Standpipe** ☐	**Other (describe)** ☐

WELL DEVELOPMENT DETAILS

Method:	Development	**SWL – Before (m):**	3.870
Date:	9/5/2018	**Time – Before:**	10:30am
Undertaken By:	AM/HW	**SWL – After (m):**	5.490
Total Vol. Removed:	6.0	**Time – After:**	10:51am
PID Reading (ppm):	9.4		

Comments:

DEVELOPMENT MEASUREMENTS

Volume Removed (L)	Temp (°C)	DO (mg/L)	EC (µS/m)	pH	Eh (mV)
1	21.6	3.4	346.1	7.38	141.9
3	21.7	3.0	326.6	7.26	185.3
5	21.8	2.6	328.4	7.12	170.5
6	22.1	2.3	362.6	6.96	118.9
Well went dry at 5.0L, recharging at 0.5L per minutes.					

Comments:Odours (YES / (NO)), NAPL/PSH (YES / (NO)), Sheen (YES / (NO)), Steady State Achieved (YES / (NO))

Large silt loading.

Tested By:	
Date Tested:	
Checked By:	
Date:	

Remarks:

- All measurements are corrected to ground level
- All stated Volumes are in Litres
- SWL is an abbreviation for standing water level
- Steady state conditions - difference in the pH less than 0.2 units and difference in conductivity less than 10%
- Minimum 3 monitoring well volumes are purged

ENVIRONMENTAL INVESTIGATION SERVICES

CONSULTING ENVIRONMENTAL ENGINEERS

EIS

Client:	DESIGNINC SYDNEY PTY LTD	**Job No.:**	E30361KH
Project:	Proposed Redevelopment of Ultimo Public School	**Well No.:**	104
Location:	ULTIMO PUBLIC SCHOOL, 189 JONES STREET, ULTIMO, NSW	**Depth (m):**	6.40

WELL FINISH

	Gatic Cover		**Standpipe**		**Other (describe)**

WELL PURGE DETAILS:

Method:	Peristaltic	**SWL – Before:**	6.32
Date:	16/5/18	**Time – Before:**	1.00
Undertaken By:	AM	**Total Vol Removed:**	100mL
Pump Program No:	85937	**PID (ppm):**	0

PURGING / SAMPLING MEASUREMENTS

Time (min)	SWL (m)	Vol (L)	Notes	Temp (°C)	DO (mg/L)	EC (µS/cm)	pH	Eh (mV)
Dry								

Comments: Odours (YES / NO), NAPL/PSH (YES / NO), Sheen (YES / NO), Steady State Achieved (YES / NO)

Started pumping straight away went dry slow recharge

Sampling Containers Used: x glass amber, ½x BTEX vials, x H2NO3 plastic, x H2SO4 plastic, x unpreserved plastic

Tested By: Alistair Mitchell	**Remarks:**
Date Tested:	- All measurements are corrected to ground level
Checked By:	- SWL is an abbreviation for standing water level
Date:	- Steady state conditions - difference in the pH less than 0.2 units and difference in conductivity less than 10%

Appendix G: Guidelines and Reference Documents

Acid Sulfate Soils Management Advisory Committee (ASSMAC), (1998). Acid Sulfate Soils Manual

Australian and New Zealand Environment Conservation Council (ANZECC), (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality

CRC Care, (2011). Technical Report No. 10 – Health screening levels for hydrocarbons in soil and groundwater Part 1: Technical development document

CRC Care, (2017). Technical Report No. 39 – Risk-based management and guidance for benzo(a)pyrene

Contaminated Land Management Act 1997 (NSW)

Department of Land and Water Conservation, (1997). 1:25,000 Acid Sulfate Soil Risk Map (Series 9130N3, Ed 2)

Managing Land Contamination, Planning Guidelines SEPP55 – Remediation of Land (1998)

National Health and Medical Research Council (NHMRC), (2011). National Water Quality Management Strategy, Australian Drinking Water Guidelines

NSW Department of Environment and Conservation, (2007). Guidelines for the Assessment and Management of Groundwater Contamination

NSW EPA, (1995). Contaminated Sites Sampling Design Guidelines

NSW EPA, (2014). Waste Classification Guidelines - Part 1: Classifying Waste

NSW EPA, (2015). Guidelines on the Duty to Report Contamination under Section 60 of the CLM Act 1997

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Appendix H: Preliminary ESA Laboratory Summary Tables

TABLE A
SOIL LABORATORY RESULTS COMPARED TO HILs
All data in mg/kg unless stated otherwise

			HEAVY METALS								PAHs		ORGANOCHLORINE PESTICIDES (OCPs)							OP PESTICIDES (OPPs)	TOTAL PCBs	ASBESTOS FIBRES
			Arsenic	Cadmium	Chromium VI [2]	Copper	Lead	Mercury	Nickel	Zinc	Total PAHs	B(a)P TEQ [3]	HCB	Endosulfan	Methoxychlor	Aldrin & Dieldrin	Chlordane	DDT, DDD & DDE	Heptachlor	Chlorpyrifos		
PQL - Envirolab Services			4	0.4	1	1	1	0.1	1	1	-	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	100
Site Assessment Criteria (SAC) [1]			100	20	100	6000	300	40	400	7400	300	3	10	270	300	6	50	240	6	160	1	Detected/Not Detected
Sample Reference	**Sample Depth**	**Sample Description**																				
BH1	0.1-0.2	Fill: silty sand	LPQL	LPQL	13	43	33	LPQL	11	48	3.3	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.1	LPQL
BH1	1-1.2	Fill: silty sand	5	LPQL	18	57	59	0.3	16	65	3.2	LPQL	NA	NA	NA	NA	NA	NA	NA	NA	NA	LPQL
BH1	1.5-1.95	Clayey sand	LPQL	LPQL	5	4	20	LPQL	LPQL	3	LPQL	LPQL	NA	NA	NA	NA	NA	NA	NA	NA	NA	LPQL
BH2	0.4-0.5	Fill: silty sand	LPQL	LPQL	18	41	18	0.1	74	100	3.8	LPQL	NA	NA	NA	NA	NA	NA	NA	NA	NA	LPQL
BH2	1-1.2	Fill: silty sand	LPQL	LPQL	15	55	19	0.1	110	94	3.2	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH2	1.5-1.95	Clayey sand	5	LPQL	7	8	19	0.2	1	17	LPQL	LPQL	NA	NA	NA	NA	NA	NA	NA	NA	NA	LPQL
BH2	2.5-2.8	Silty sand	4	LPQL	14	13	13	LPQL	5	44	LPQL	LPQL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH3	0.1-0.3	Fill: silty sand	5	LPQL	15	48	110	0.5	8	130	12	1.4	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH3	0.5-0.95	Fill: silty sand	5	LPQL	14	58	110	0.6	6	110	19	2.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	LPQL
BH3	1.5-1.95	Fill: silty sand	5	LPQL	10	78	290	0.3	3	120	LPQL	LPQL	NA	NA	NA	NA	NA	NA	NA	NA	NA	LPQL
BH3	6-6.45	Fill: silty sand	6	LPQL	18	24	99	0.4	6	50	3.8	LPQL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH3	7.5-7.95	Sandy clay	LPQL	LPQL	9	4	27	0.2	1	39	0.64	LPQL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH4	0.1-0.2	Fill: silty sand	LPQL	LPQL	6	5	15	LPQL	2	18	1.3	LPQL	NA	NA	NA	NA	NA	NA	NA	NA	NA	LPQL
BH4	0.6-0.95	Fill: silty sand	4	LPQL	18	26	89	0.4	11	92	5.5	0.7	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH4	1.5-1.95	Fill: silty sand	8	LPQL	16	42	53	0.4	21	41	1.4	LPQL	NA	NA	NA	NA	NA	NA	NA	NA	NA	LPQL
BH4	3-3.45	Fill: silty sand	LPQL	LPQL	8	20	89	0.3	13	59	2.2	LPQL	NA	NA	NA	NA	NA	NA	NA	NA	NA	LPQL
BH5	0.2-0.4	Fill: silty sand	LPQL	LPQL	14	27	42	0.2	8	39	3.9	0.5	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH5	0.5-0.95	Fill: silty sand	LPQL	LPQL	20	27	36	0.1	24	43	11	1.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH5	1.5-1.95	Fill: silty sand	5	LPQL	17	110	170	1.5	14	100	14	1.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	LPQL
BH5	3-3.45	Fill: silty sand	5	LPQL	19	49	80	0.4	17	50	13	1.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	LPQL
BH6	0.05-0.15	Fill: sandy gravel	LPQL	LPQL	3	220	10	1.5	6	43	0.3	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH6	0.5-0.95	Fill: silty sand	11	LPQL	12	64	130	0.4	10	160	98	**13**	NA	NA	NA	NA	NA	NA	NA	NA	NA	LPQL
BH6	1.5-1.95	Fill: silty sand	9	LPQL	13	46	**310**	1.8	13	420	17	2.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH6	3-3.45	Fill: silty sand	7	LPQL	12	110	**400**	2.1	5	200	11	1.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	LPQL
BH6	6-6.45	Fill: silty sand	5	LPQL	13	13	61	0.3	5	28	8.8	0.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH7	0.05-0.1	Fill: gravelly sand	LPQL	LPQL	5	150	10	0.1	6	41	0.4	LPQL	NA	NA	NA	NA	NA	NA	NA	NA	NA	LPQL
BH7	0.4-0.5	Fill: silty sand	LPQL	LPQL	26	21	14	LPQL	10	51	0.1	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH7	1.5-1.95	Fill: silty sand	5	LPQL	9	13	89	0.2	4	60	1.6	LPQL	NA	NA	NA	NA	NA	NA	NA	NA	NA	LPQL
BH7	6-6.45	Fill: silty sand	5	LPQL	15	22	98	0.6	7	120	5.1	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH8	0.5-0.7	Fill: clayey sand	26	LPQL	20	10	32	0.3	4	54	0.3	LPQL	NA	NA	NA	NA	NA	NA	NA	NA	NA	LPQL
BH8	1.5-1.95	Fill: silty sand	5	LPQL	16	19	110	2.4	2	25	6.7	0.7	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH8	4.5-4.95	Fill: silty sand	6	LPQL	16	34	90	0.4	9	54	3.7	LPQL	NA	NA	NA	NA	NA	NA	NA	NA	NA	LPQL
Total Number of Samples			32	32	32	32	32	32	32	32	32	32	8	8	8	8	8	8	8	8	8	25
Maximum Value			26	LPQL	26	220	400	2.4	110	420	98	13	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.1	NC

Preliminary ESA

Explanation:

1 - Site Assessment Criteria (SAC): NEPM 2013, HIL-A: 'Residential with garden/accessible soils; children's day care centers; preschools; and primary schools'

2 - The results are for Total Chromium which includes Chromium III and VI. For initial screening purposes, we have assumed that the samples contain only Chromium VI unless demonstrated otherwise by additional analysis.

3 - B(a)P TEQ - Benzo(a)pyrene Toxicity Equivalence Quotient has been calculated based on 8 carcinogenic PAHs and their Toxic Equivalence Factors (TEFs) outlined in NEPM 2013

Concentration above the SAC **VALUE**

Abbreviations:

PAHs: Polycyclic Aromatic Hydrocarbons
B(a)P: Benzo(a)pyrene
PQL: Practical Quantitation Limit
LPQL: Less than PQL
OPP: Organophosphorus Pesticides
OCP: Organochlorine Pesticides
PCBs: Polychlorinated Biphenyls
UCL: Upper Level Confidence Limit on Mean Value
HILs: Health Investigation Levels
NA: Not Analysed
NC: Not Calculated
NSL: No Set Limit
SAC: Site Assessment Criteria
NEPM: National Environmental Protection Measure

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TABLE B
SOIL LABORATORY RESULTS COMPARED TO HSLs
All data in mg/kg unless stated otherwise

					C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	PID [2]
PQL - Envirolab Services					25	50	0.2	0.5	1	3	1	
HSL Land Use Category [1]					**RESIDENTIAL WITH ACCESSIBLE SOIL**							
Sample Reference	**Sample Depth**	**Sample Description**	**Depth Category**	**Soil Category**								
BH1	0.1-0.2	Fill: silty sand	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH1	1-1.2	Fill: silty sand	1m to <2m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH1	1.5-1.95	Clayey sand	1m to <2m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH2	0.4-0.5	Fill: silty sand	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH2	1-1.2	Fill: silty sand	1m to <2m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH2	1.5-1.95	Clayey sand	1m to <2m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH2	2.5-2.8	Silty sand	2m to <4m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH3	0.1-0.3	Fill: silty sand	0m to < 1m	Sand	LPQL	61	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH3	0.5-0.95	Fill: silty sand	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH3	1.5-1.95	Fill: silty sand	1m to <2m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH3	6-6.45	Fill: silty sand	4m+	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH3	7.5-7.95	Sandy clay	4m+	Clay	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH4	0.1-0.2	Fill: silty sand	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH4	0.6-0.95	Fill: silty sand	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH4	1.5-1.95	Fill: silty sand	1m to <2m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH4	3-3.45	Fill: silty sand	2m to <4m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH5	0.2-0.4	Fill: silty sand	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH5	0.5-0.95	Fill: silty sand	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH5	1.5-1.95	Fill: silty sand	1m to <2m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH5	3-3.45	Fill: silty sand	2m to <4m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH6	0.05-0.15	Fill: sandy gravel	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH6	0.5-0.95	Fill: silty sand	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH6	1.5-1.95	Fill: silty sand	1m to <2m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH6	3-3.45	Fill: silty sand	2m to <4m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH6	6-6.45	Fill: silty sand	4m+	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH7	0.05-0.1	Fill: gravelly sand	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH7	0.4-0.5	Fill: silty sand	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH7	1.5-1.95	Fill: silty sand	1m to <2m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH7	6-6.45	Fill: silty sand	4m+	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH8	0.5-0.7	Fill: clayey sand	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH8	1.5-1.95	Fill: silty sand	1m to <2m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH8	4.5-4.95	Fill: silty sand	4m+	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
Total Number of Samples					32	32	32	32	32	32	32	32
Maximum Value					LPQL	61	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL

Preliminary ESA

Explanation:
1 - Site Assessment Criteria (SAC): NEPM 2013
2 - Field PID values obtained during the investigation

Concentration above the SAC **VALUE**
The guideline corresponding to the elevated value is highlighted in grey in the Site Assessment Criteria Table below

Abbreviations:

UCL: Upper Level Confidence Limit on Mean Value	NC: Not Calculated	PQL: Practical Quantitation Limit
HSLs: Health Screening Levels	NL: Not Limiting	LPQL: Less than PQL
NA: Not Analysed	SAC: Site Assessment Criteria	NEPM: National Environmental Protection Measure

SITE ASSESSMENT CRITERIA

					C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene
PQL - Envirolab Services					25	50	0.2	0.5	1	3	1
HSL Land Use Category [1]					**RESIDENTIAL WITH ACCESSIBLE SOIL**						
Sample Reference	**Sample Depth**	**Sample Description**	**Depth Category**	**Soil Category**							
BH1	0.1-0.2	Fill: silty sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH1	1-1.2	Fill: silty sand	1m to <2m	Sand	70	240	0.5	220	NL	60	NL
BH1	1.5-1.95	Clayey sand	1m to <2m	Sand	70	240	0.5	220	NL	60	NL
BH2	0.4-0.5	Fill: silty sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH2	1-1.2	Fill: silty sand	1m to <2m	Sand	70	240	0.5	220	NL	60	NL
BH2	1.5-1.95	Clayey sand	1m to <2m	Sand	70	240	0.5	220	NL	60	NL
BH2	2.5-2.8	Silty sand	2m to <4m	Sand	110	440	0.5	310	NL	95	NL
BH3	0.1-0.3	Fill: silty sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH3	0.5-0.95	Fill: silty sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH3	1.5-1.95	Fill: silty sand	1m to <2m	Sand	70	240	0.5	220	NL	60	NL
BH3	6-6.45	Fill: silty sand	4m+	Sand	200	NL	0.5	540	NL	170	NL
BH3	7.5-7.95	Sandy clay	4m+	Clay	290	NL	3	NL	NL	NL	NL
BH4	0.1-0.2	Fill: silty sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH4	0.6-0.95	Fill: silty sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH4	1.5-1.95	Fill: silty sand	1m to <2m	Sand	70	240	0.5	220	NL	60	NL
BH4	3-3.45	Fill: silty sand	2m to <4m	Sand	110	440	0.5	310	NL	95	NL
BH5	0.2-0.4	Fill: silty sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH5	0.5-0.95	Fill: silty sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH5	1.5-1.95	Fill: silty sand	1m to <2m	Sand	70	240	0.5	220	NL	60	NL
BH5	3-3.45	Fill: silty sand	2m to <4m	Sand	110	440	0.5	310	NL	95	NL
BH6	0.05-0.15	Fill: sandy gravel	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH6	0.5-0.95	Fill: silty sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH6	1.5-1.95	Fill: silty sand	1m to <2m	Sand	70	240	0.5	220	NL	60	NL
BH6	3-3.45	Fill: silty sand	2m to <4m	Sand	110	440	0.5	310	NL	95	NL
BH6	6-6.45	Fill: silty sand	4m+	Sand	200	NL	0.5	540	NL	170	NL
BH7	0.05-0.1	Fill: gravelly sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH7	0.4-0.5	Fill: silty sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH7	1.5-1.95	Fill: silty sand	1m to <2m	Sand	70	240	0.5	220	NL	60	NL
BH7	6-6.45	Fill: silty sand	4m+	Sand	200	NL	0.5	540	NL	170	NL
BH8	0.5-0.7	Fill: clayey sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH8	1.5-1.95	Fill: silty sand	1m to <2m	Sand	70	240	0.5	220	NL	60	NL
BH8	4.5-4.95	Fill: silty sand	4m+	Sand	200	NL	0.5	540	NL	170	NL

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TABLE C
SOIL LABORATORY RESULTS COMPARED TO EILs AND ESLs
All data in mg/kg unless stated otherwise

Land Use Category [1]				URBAN RESIDENTIAL AND PUBLIC OPEN SPACE																		
							AGED HEAVY METALS-EILs						EILs		ESLs							
				pH	CEC ($cmol_c/kg$)	Clay Content (% clay)	Arsenic	Chromium	Copper	Lead	Nickel	Zinc	Naphthalene	DDT	C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	>C_{16}-C_{34} (F3)	>C_{34}-C_{40} (F4)	Benzene	Toluene	Ethylbenzene	Total Xylenes	B(a)P
PQL - Envirolab Services				-	1	-	4	1	1	1	1	1	0.1	0.1	25	50	100	100	0.2	0.5	1	3	0.05
Ambient Background Concentration (ABC) [2]				-	-	-	NSL	13	28	163	5	122	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL
Sample Reference	**Sample Depth**	**Sample Description**	**Soil Texture**																			
BH1	0.1-0.2	Fill: silty sand	Coarse	NA	NA	NA	LPQL	13	43	33	11	48	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.1
BH1	1-1.2	Fill: silty sand	Coarse	NA	NA	NA	5	18	57	59	16	65	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.3
BH1	1.5-1.95	Clayey sand	Coarse	NA	NA	NA	LPQL	5	4	20	LPQL	3	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH2	0.4-0.5	Fill: silty sand	Coarse	NA	NA	NA	LPQL	18	41	18	74	100	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.3
BH2	1-1.2	Fill: silty sand	Coarse	9.7	6	123	LPQL	15	55	19	110	94	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.2
BH2	1.5-1.95	Clayey sand	Coarse	NA	NA	NA	5	7	8	19	1	17	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH2	2.5-2.8	Silty sand	Coarse	NA	NA	NA	4	14	13	13	5	44	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH3	0.1-0.3	Fill: silty sand	Coarse	NA	NA	NA	5	15	48	110	8	130	LPQL	LPQL	LPQL	61	100	LPQL	LPQL	LPQL	LPQL	LPQL	0.98
BH3	0.5-0.95	Fill: silty sand	Coarse	NA	NA	NA	5	14	58	110	6	110	NA	NA	LPQL	LPQL	200	LPQL	LPQL	LPQL	LPQL	LPQL	1.7
BH3	1.5-1.95	Fill: silty sand	Coarse	NA	NA	NA	5	10	78	290	3	120	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH3	6-6.45	Fill: silty sand	Coarse	NA	NA	NA	6	18	24	99	6	50	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.2
BH3	7.5-7.95	Sandy clay	Fine	NA	NA	NA	LPQL	9	4	27	1	39	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.07
BH4	0.1-0.2	Fill: silty sand	Coarse	NA	NA	NA	LPQL	6	5	15	2	18	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.1
BH4	0.6-0.95	Fill: silty sand	Coarse	NA	NA	NA	4	18	26	89	11	92	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.51
BH4	1.5-1.95	Fill: silty sand	Coarse	NA	NA	NA	8	16	42	53	21	41	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.1
BH4	3-3.45	Fill: silty sand	Coarse	NA	NA	NA	LPQL	8	20	89	13	59	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.2
BH5	0.2-0.4	Fill: silty sand	Coarse	NA	NA	NA	LPQL	14	27	42	8	39	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.4
BH5	0.5-0.95	Fill: silty sand	Coarse	NA	NA	NA	LPQL	20	27	36	24	43	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.83
BH5	1.5-1.95	Fill: silty sand	Coarse	NA	NA	NA	5	17	110	170	14	100	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	1.1
BH5	3-3.45	Fill: silty sand	Coarse	NA	NA	NA	5	19	49	80	17	50	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	1.1
BH6	0.05-0.15	Fill: sandy gravel	Coarse	9.3	4	34	LPQL	3	220	10	6	43	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.05
BH6	0.5-0.95	Fill: silty sand	Coarse	NA	NA	NA	11	12	64	130	10	160	NA	NA	LPQL	LPQL	590	190	LPQL	LPQL	LPQL	LPQL	8.9
BH6	1.5-1.95	Fill: silty sand	Coarse	8.3	15	9.8	9	13	46	310	13	420	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	1.5
BH6	3-3.45	Fill: silty sand	Coarse	NA	NA	NA	7	12	110	400	5	200	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.88
BH6	6-6.45	Fill: silty sand	Coarse	NA	NA	NA	5	13	13	61	5	28	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.7
BH7	0.05-0.1	Fill: gravelly sand	Coarse	NA	NA	NA	LPQL	5	150	10	6	41	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.06
BH7	0.4-0.5	Fill: silty sand	Coarse	NA	NA	NA	LPQL	26	21	14	10	51	LPQL	LPQL	LPQL	LPQL	LPQL	100	LPQL	LPQL	LPQL	LPQL	LPQL
BH7	1.5-1.95	Fill: silty sand	Coarse	NA	NA	NA	5	9	13	89	4	60	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.2
BH7	6-6.45	Fill: silty sand	Coarse	NA	NA	NA	5	15	22	98	7	120	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.4
BH8	0.5-0.7	Fill: clayey sand	Coarse	NA	NA	NA	26	20	10	32	4	54	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.05
BH8	1.5-1.95	Fill: silty sand	Coarse	NA	NA	NA	5	16	19	110	2	25	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.51
BH8	4.5-4.95	Fill: silty sand	Coarse	NA	NA	NA	6	16	34	90	9	54	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0.3
Total Number of Samples				3	3	3	32	32	32	32	32	32	8	8	32	32	32	32	32	32	32	32	32
Maximum Value				9.7	15	123	26	26	220	400	110	420	LPQL	LPQL	LPQL	61	590	190	LPQL	LPQL	LPQL	LPQL	8.9

Explanation:

1 - Site Assessment Criteria (SAC): NEPM 2013

2 - ABC Values for selected metals has been adopted from the published background concentrations presented in Olszowy et. al., (1995), Trace Element Concentrations in Soils from Rural and Urban New South Wales (the 25th percentile values for old suburbs with high traffic have been quoted)

Concentration above the SAC — VALUE

The guideline corresponding to the elevated value is highlighted in grey in the EIL and ESL Assessment Criteria Table below

Abbreviations:

EILs: Ecological Investigation Levels
UCL: Upper Level Confidence Limit on Mean Value
LPQL: Less than PQL
NC: Not Calculated
B(a)P: Benzo(a)pyrene
ESLs: Ecological Screening Levels
SAC: Site Assessment Criteria
NSL: No Set Limit
PQL: Practical Quantitation Limit
NA: Not Analysed
NEPM: National Environmental Protection Measure
ABC: Ambient Background Concentration

Preliminary ESA

EIL AND ESL ASSESSMENT CRITERIA

Land Use Category [1]				URBAN RESIDENTIAL AND PUBLIC OPEN SPACE																		
							AGED HEAVY METALS-EILs						EILs		ESLs							
				pH	CEC ($cmol_c/kg$)	Clay Content (% clay)	Arsenic	Chromium	Copper	Lead	Nickel	Zinc	Naphthalene	DDT	C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	>C_{16}-C_{34} (F3)	>C_{34}-C_{40} (F4)	Benzene	Toluene	Ethylbenzene	Total Xylenes	B(a)P
PQL - Envirolab Services				-	1	-	4	1	1	1	1	1	0.1	0.1	25	50	100	100	0.2	0.5	1	3	0.05
Ambient Background Concentration (ABC) [2]				-	-	-	NSL	13	28	163	5	122	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL
Sample Reference	**Sample Depth**	**Sample Description**	**Soil Texture**																			
BH1	0.1-0.2	Fill: silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	33
BH1	1-1.2	Fill: silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	--	--	180	120	300	2800	50	85	70	105	33
BH1	1.5-1.95	Clayey sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	--	--	180	120	300	2800	50	85	70	105	33
BH2	0.4-0.5	Fill: silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	--	--	180	120	300	2800	50	85	70	105	33
BH2	1-1.2	Fill: silty sand	Coarse	9.7	6	123	100	413	218	1263	175	522	170	180	180	120	300	2800	50	85	70	105	33
BH2	1.5-1.95	Clayey sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	--	--	180	120	300	2800	50	85	70	105	33
BH2	2.5-2.8	Silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	--	--	180	120	300	2800	50	85	70	105	33
BH3	0.1-0.3	Fill: silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	33
BH3	0.5-0.95	Fill: silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	--	--	180	120	300	2800	50	85	70	105	33
BH3	1.5-1.95	Fill: silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	--	--	180	120	300	2800	50	85	70	105	33
BH3	6-6.45	Fill: silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	--	--	180	120	300	2800	50	85	70	105	33
BH3	7.5-7.95	Sandy clay	Fine	NA	NA	NA	100	203	88	1263	35	192	--	--	180	120	1300	5600	60	105	125	45	33
BH4	0.1-0.2	Fill: silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	--	--	180	120	300	2800	50	85	70	105	33
BH4	0.6-0.95	Fill: silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	33
BH4	1.5-1.95	Fill: silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	--	--	180	120	300	2800	50	85	70	105	33
BH4	3-3.45	Fill: silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	--	--	180	120	300	2800	50	85	70	105	33
BH5	0.2-0.4	Fill: silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	33
BH5	0.5-0.95	Fill: silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	--	--	180	120	300	2800	50	85	70	105	33
BH5	1.5-1.95	Fill: silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	--	--	180	120	300	2800	50	85	70	105	33
BH5	3-3.45	Fill: silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	--	--	180	120	300	2800	50	85	70	105	33
BH6	0.05-0.15	Fill: sandy gravel	Coarse	9.3	4	34	100	413	123	1263	35	352	170	180	180	120	300	2800	50	85	70	105	33
BH6	0.5-0.95	Fill: silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	--	--	180	120	300	2800	50	85	70	105	33
BH6	1.5-1.95	Fill: silty sand	Coarse	8.3	15	9.8	100	413	238	1263	275	822	--	--	180	120	300	2800	50	85	70	105	33
BH6	3-3.45	Fill: silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	--	--	180	120	300	2800	50	85	70	105	33
BH6	6-6.45	Fill: silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	--	--	180	120	300	2800	50	85	70	105	33
BH7	0.05-0.1	Fill: gravelly sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	--	--	180	120	300	2800	50	85	70	105	33
BH7	0.4-0.5	Fill: silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	33
BH7	1.5-1.95	Fill: silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	--	--	180	120	300	2800	50	85	70	105	33
BH7	6-6.45	Fill: silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	--	--	180	120	300	2800	50	85	70	105	33
BH8	0.5-0.7	Fill: clayey sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	--	--	180	120	300	2800	50	85	70	105	33
BH8	1.5-1.95	Fill: silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	33
BH8	4.5-4.95	Fill: silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	--	--	180	120	300	2800	50	85	70	105	33

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TABLE D
SOIL LABORATORY RESULTS COMPARED TO WASTE CLASSIFICATION GUIDELINES
All data in mg/kg unless stated otherwise

			HEAVY METALS								PAHs		OC/OP PESTICIDES				Total PCBs	TRH					BTEX COMPOUNDS				ASBESTOS FIBRES
			Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Total PAHs	B(a)P	Total Endosulfans	Chloropyrifos	Total Moderately Harmful [2]	Total Scheduled[3]		C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	Total C_{10}-C_{36}	Benzene	Toluene	Ethyl benzene	Total Xylenes	
PQL - Envirolab Services			4	0.4	1	1	1	0.1	1	1	-	0.05	0.1	0.1	0.1	0.1	0.1	25	50	100	100	250	0.2	0.5	1	3	100
General Solid Waste CT1 [1]			100	20	100	NSL	100	4	40	NSL	200	0.8	60	4	250	<50	<50	650		NSL		10,000	10	288	600	1,000	-
General Solid Waste SCC1 [1]			500	100	1900	NSL	1500	50	1050	NSL	200	10	108	7.5	250	<50	<50	650		NSL		10,000	18	518	1,080	1,800	-
Restricted Solid Waste CT2 [1]			400	80	400	NSL	400	16	160	NSL	800	3.2	240	16	1000	<50	<50	2600		NSL		40,000	40	1,152	2,400	4,000	-
Restricted Solid Waste SCC2 [1]			2000	400	7600	NSL	6000	200	4200	NSL	800	23	432	30	1000	<50	<50	2600		NSL		40,000	72	2,073	4,320	7,200	-
Sample Reference	**Sample Depth**	**Sample Description**																									
BH1	0.1-0.2	Fill: silty sand	LPQL	LPQL	13	43	33	LPQL	11	48	3.3	0.1	LPQL	LPQL	LPQL	LPQL	0.1	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH1	1-1.2	Fill: silty sand	5	LPQL	18	57	59	0.3	16	65	3.2	0.3	NA	NA	NA	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH1	1.5-1.95	Clayey sand	LPQL	LPQL	5	4	20	LPQL	LPQL	3	LPQL	LPQL	NA	NA	NA	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH2	0.4-0.5	Fill: silty sand	LPQL	LPQL	18	41	18	0.1	**74**	100	3.8	0.3	NA	NA	NA	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH2	1-1.2	Fill: silty sand	LPQL	LPQL	15	55	19	0.1	**110**	94	3.2	0.2	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH2	1.5-1.95	Clayey sand	5	LPQL	7	8	19	0.2	1	17	LPQL	LPQL	NA	NA	NA	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH2	2.5-2.8	Silty sand	4	LPQL	14	13	13	LPQL	5	44	LPQL	LPQL	NA	NA	NA	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	NA
BH3	0.1-0.3	Fill: silty sand	5	LPQL	15	48	**110**	0.5	8	130	12	**0.98**	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	130	LPQL	130	LPQL	LPQL	LPQL	LPQL	LPQL
BH3	0.5-0.95	Fill: silty sand	5	LPQL	14	58	**110**	0.6	6	110	19	**1.7**	NA	NA	NA	NA	NA	LPQL	LPQL	110	110	220	LPQL	LPQL	LPQL	LPQL	LPQL
BH3	1.5-1.95	Fill: silty sand	5	LPQL	10	78	**290**	0.3	3	120	LPQL	LPQL	NA	NA	NA	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH3	6-6.45	Fill: silty sand	6	LPQL	18	24	99	0.4	6	50	3.8	0.2	NA	NA	NA	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	NA
BH3	7.5-7.95	Sandy clay	LPQL	LPQL	9	4	27	0.2	1	39	0.64	0.07	NA	NA	NA	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	NA
BH4	0.1-0.2	Fill: silty sand	LPQL	LPQL	6	5	15	LPQL	2	18	1.3	0.1	NA	NA	NA	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH4	0.6-0.95	Fill: silty sand	4	LPQL	18	26	89	0.4	11	92	5.5	0.51	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH4	1.5-1.95	Fill: silty sand	8	LPQL	16	42	53	0.4	21	41	1.4	0.1	NA	NA	NA	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH4	3-3.45	Fill: silty sand	LPQL	LPQL	8	20	89	0.3	13	59	2.2	0.2	NA	NA	NA	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH5	0.2-0.4	Fill: silty sand	LPQL	LPQL	14	27	42	0.2	8	39	3.9	0.4	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH5	0.5-0.95	Fill: silty sand	LPQL	LPQL	20	27	36	0.1	24	43	11	**0.83**	NA	NA	NA	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	NA
BH5	1.5-1.95	Fill: silty sand	5	LPQL	17	110	**170**	1.5	14	100	14	**1.1**	NA	NA	NA	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH5	3-3.45	Fill: silty sand	5	LPQL	19	49	80	0.4	17	50	13	**1.1**	NA	NA	NA	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH6	0.05-0.15	Fill: sandy gravel	LPQL	LPQL	3	220	10	1.5	6	43	0.3	0.05	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH6	0.5-0.95	Fill: silty sand	11	LPQL	12	64	**130**	0.4	10	160	98	**8.9**	NA	NA	NA	NA	NA	LPQL	LPQL	370	300	670	LPQL	LPQL	LPQL	LPQL	LPQL
BH6	1.5-1.95	Fill: silty sand	9	LPQL	13	46	**310**	1.8	13	420	17	**1.5**	NA	NA	NA	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	NA
BH6	3-3.45	Fill: silty sand	7	LPQL	12	110	**400**	2.1	5	200	11	**0.88**	NA	NA	NA	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH6	6-6.45	Fill: silty sand	5	LPQL	13	13	61	0.3	5	28	8.8	0.7	NA	NA	NA	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	NA
BH7	0.05-0.1	Fill: gravelly sand	LPQL	LPQL	5	150	10	0.1	6	41	0.4	0.06	NA	NA	NA	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH7	0.4-0.5	Fill: silty sand	LPQL	LPQL	26	21	14	LPQL	10	51	0.1	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	100	100	LPQL	LPQL	LPQL	LPQL	LPQL
BH7	1.5-1.95	Fill: silty sand	5	LPQL	9	13	89	0.2	4	60	1.6	0.2	NA	NA	NA	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH7	6-6.45	Fill: silty sand	5	LPQL	15	22	98	0.6	7	120	5.1	0.4	NA	NA	NA	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	NA
BH8	0.5-0.7	Fill: clayey sand	26	LPQL	20	10	32	0.3	4	54	0.3	0.05	NA	NA	NA	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH8	1.5-1.95	Fill: silty sand	5	LPQL	16	19	**110**	2.4	2	25	6.7	0.51	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH8	4.5-4.95	Fill: silty sand	6	LPQL	16	34	90	0.4	9	54	3.7	0.3	NA	NA	NA	NA	NA	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
Total Number of samples			32	32	32	32	32	32	32	32	32	32	8	8	8	8	8	32	32	32	32	32	32	32	32	32	25
Maximum Value			26	LPQL	26	220	400	2.4	110	420	98	8.9	LPQL	LPQL	LPQL	LPQL	0.1	LPQL	LPQL	370	300	670	LPQL	LPQL	LPQL	LPQL	NC

Explanation:

[1] - NSW EPA Waste Classification Guidelines, Part 1: Classifying Waste (2014)

[2] - Assessment of Total Moderately Harmful pesticides includes: Dichlorovos, Dimethoate, Fenitrothion, Ethion, Malathion and Parathion

[3] - Assessment of Total Scheduled pesticides include: HBC, alpha-BHC, gamma-BHC, beta-BHC, Heptachlor, Aldrin, Heptachlor Epoxide, gamma-Chlordane, alpha-chlordane, pp-DDE, Dieldrin, Endrin, pp-DDD, pp-DDT, Endrin Aldehyde

Concentration above the CT1 **VALUE**
Concentration above SCC1 **VALUE**
Concentration above the SCC2 **VALUE**

Abbreviations:

PAHs: Polycyclic Aromatic Hydrocarbons
B(a)P: Benzo(a)pyrene
PQL: Practical Quantitation Limit
LPQL: Less than PQL
PID: Photoionisation Detector
PCBs: Polychlorinated Biphenyls
UCL: Upper Level Confidence Limit on Mean Value
NA: Not Analysed
NC: Not Calculated
NSL: No Set Limit
SAC: Site Assessment Criteria
TRH: Total Recoverable Hydrocarbons
CT: Contaminant Threshold
SCC: Specific Contaminant Concentration
HILs: Health Investigation Levels
NEPM: National Environmental Protection Measure
BTEX: Monocyclic Aromatic Hydrocarbons

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TABLE E
SOIL LABORATORY TCLP RESULTS
All data in mg/L unless stated otherwise

			Lead	Nickel	B(a)P
PQL - Envirolab Services			0.03	0.02	0.001
TCLP1 - General Solid Waste [1]			5	2	0.04
TCLP2 - Restricted Solid Waste [1]			20	8	0.16
TCLP3 - Hazardous Waste [1]			>20	>8	>0.16
Sample Reference	**Sample Depth**	**Sample Description**			
BH2	0.4-0.5	Fill: silty sand	NA	LPQL	NA
BH2	1-1.2	Fill: silty sand	NA	0.08	NA
BH3	0.1-0.3	Fill: silty sand	0.1	NA	LPQL
BH3	0.5-0.95	Fill: silty sand	0.2	NA	LPQL
BH3	1.5-1.95	Fill: silty sand	0.08	NA	NA
BH5	0.5-0.95	Fill: silty sand	NA	NA	LPQL
BH5	1.5-1.95	Fill: silty sand	0.3	NA	LPQL
BH5	3-3.45	Fill: silty sand	NA	NA	LPQL
BH6	0.5-0.95	Fill: silty sand	0.08	NA	LPQL
BH6	1.5-1.95	Fill: silty sand	0.32	NA	NA
BH6	3-3.45	Fill: silty sand	0.54	NA	LPQL
BH8	1.5-1.95	Fill: silty sand	LPQL	NA	NA
Total Number of samples			8	2	7
Maximum Value			0.54	0.08	LPQL

Preliminary ESA

Explanation:

1 - NSW EPA Waste Classification Guidelines, Part 1: Classifying Waste (2014)

General Solid Waste	**VALUE**
Restricted Solid Waste	**VALUE**
Hazardous Waste	**VALUE**

Abbreviations:

PQL: Practical Quantitation Limit
LPQL: Less than PQL
B(a)P: Benzo(a)pyrene
NC: Not Calculated
NA: Not Analysed
TCLP: Toxicity Characteristics Leaching Procedure

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TABLE F
SOIL INTRA-LABORATORY DUPLICATE RESULTS & RPD CALCULATIONS
All results in mg/kg unless stated otherwise

SAMPLE	ANALYSIS	Envirolab PQL	INITIAL	REPEAT	MEAN	RPD %
Sample Ref = BH6 (0.05-0.15m)	Arsenic	4	LPQL	LPQL	NC	NC
Dup Ref = Dup 2	Cadmium	0.4	LPQL	LPQL	NC	NC
	Chromium	1	3	3	3.0	0
Envirolab Report: 165375	Copper	1	220	190	205.0	15
	Lead	1	10	9	9.5	11
	Mercury	0.1	1.5	LPQL	0.8	187
	Nickel	1	6	6	6.0	0
	Zinc	1	43	42	42.5	2
	Naphthalene	0.1	LPQL	LPQL	NC	NC
	Acenaphthylene	0.1	LPQL	LPQL	NC	NC
	Acenaphthene	0.1	LPQL	LPQL	NC	NC
	Fluorene	0.1	LPQL	LPQL	NC	NC
	Phenanthrene	0.1	0.1	LPQL	0.1	67
	Anthracene	0.1	LPQL	LPQL	NC	NC
	Fluoranthene	0.1	0.2	0.2	0.2	0
	Pyrene	0.1	0.2	0.2	0.2	0
	Benzo(a)anthracene	0.1	LPQL	LPQL	NC	NC
	Chrysene	0.1	0.1	LPQL	0.1	67
	Benzo(b,j+k)fluoranthene	0.2	LPQL	LPQL	NC	NC
	Benzo(a)pyrene	0.05	0.07	0.07	0.1	0
	Indeno(123-cd)pyrene	0.1	LPQL	LPQL	NC	NC
	Dibenzo(ah)anthracene	0.1	LPQL	LPQL	NC	NC
	Benzo(ghi)perylene	0.1	LPQL	LPQL	NC	NC
	TRH C6-C10 (F1)	25	LPQL	LPQL	NC	NC
	TRH >C10-C16 (F2)	50	LPQL	LPQL	NC	NC
	TRH >C16-C34 (F3)	100	LPQL	LPQL	NC	NC
	TRH >C34-C40 (F4)	100	LPQL	LPQL	NC	NC
	Benzene	0.5	LPQL	LPQL	NC	NC
	Toluene	0.5	LPQL	LPQL	NC	NC
	Ethylbenzene	1	LPQL	LPQL	NC	NC
	m+p-xylene	2	LPQL	LPQL	NC	NC
	o-xylene	1	LPQL	LPQL	NC	NC

Preliminary ESA

Explanation:

The RPD value is calculated as the absolute value of the difference between the initial and repeat results divided by the average value expressed as a percentage. The following acceptance criteria will be used to assess the RPD results:

Results > 10 times PQL = RPD value <= 50% are acceptable
Results between 5 & 10 times PQL = RPD value <= 75% are acceptable
Results < 5 times PQL = RPD value <= 100% are acceptable
If result is LPQL then 50% of the PQL is used for the calculation

RPD Results Above the Acceptance Criteria VALUE

Abbreviations:

PQL: Practical Quantitation Limit
LPQL: Less than PQL
NA: Not Analysed
NC: Not Calculated
OCP: Organochlorine Pesticides
OPP: Organophosphorus Pesticides
PCBs: Polychlorinated Biphenyls
TRH: Total Recoverable Hydrocarbons

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TABLE G
SOIL INTER-LABORATORY DUPLICATE RESULTS & RPD CALCULATIONS
All results in mg/kg unless stated otherwise

SAMPLE	ANALYSIS	Envirolab PQL	Envirolab VIC PQL	INITIAL	REPEAT	MEAN	RPD %
Sample Ref = BH2 (1-1.2m)	Arsenic	4	4	LPQL	LPQL	NC	NC
Dup Ref = Dup 3	Cadmium	0.4	0.4	LPQL	LPQL	NC	NC
	Chromium	1	1	15	17	16.0	13
Envirolab Report: 165375	Copper	1	1	55	55	55.0	0
Envirolab VIC Report: 194747	Lead	1	1	19	15	17.0	24
	Mercury	0.1	0.1	0.1	0.1	0.1	0
	Nickel	1	1	110	120	115.0	9
	Zinc	1	1	94	90	92.0	4
	Naphthalene	0.1	0.1	LPQL	LPQL	NC	NC
	Acenaphthylene	0.1	0.1	LPQL	LPQL	NC	NC
	Acenaphthene	0.1	0.1	LPQL	LPQL	NC	NC
	Fluorene	0.1	0.1	LPQL	LPQL	NC	NC
	Phenanthrene	0.1	0.1	0.4	0.3	0.4	29
	Anthracene	0.1	0.1	LPQL	LPQL	NC	NC
	Fluoranthene	0.1	0.1	0.6	0.6	0.6	0
	Pyrene	0.1	0.1	0.7	0.7	0.7	0
	Benzo(a)anthracene	0.1	0.1	0.3	0.2	0.3	40
	Chrysene	0.1	0.1	0.3	0.3	0.3	0
	Benzo(b,j+k)fluoranthene	0.2	0.2	0.4	0.4	0.4	0
	Benzo(a)pyrene	0.05	0.05	0.2	0.26	0.2	26
	Indeno(123-cd)pyrene	0.1	0.1	0.1	0.2	0.2	67
	Dibenzo(ah)anthracene	0.1	0.1	LPQL	LPQL	NC	NC
	Benzo(ghi)perylene	0.1	0.1	0.1	0.2	0.2	67
	Benzo(a)pyrene TEQ	0.5	0.5	LPQL	LPQL	NC	NC
	TRH C6-C10 (F1)	25	25	LPQL	LPQL	NC	NC
	TRH >C10-C16 (F2)	50	50	LPQL	LPQL	NC	NC
	TRH >C16-C34 (F3)	100	100	LPQL	LPQL	NC	NC
	TRH >C34-C40 (F4)	100	100	LPQL	LPQL	NC	NC
	Benzene	0.5	0.5	LPQL	LPQL	NC	NC
	Toluene	0.5	0.5	LPQL	LPQL	NC	NC
	Ethylbenzene	1	1	LPQL	LPQL	NC	NC
	m+p-xylene	2	2	LPQL	LPQL	NC	NC
	o-xylene	1	1	LPQL	LPQL	NC	NC

Preliminary ESA

Explanation:

The RPD value is calculated as the absolute value of the difference between the initial and repeat results divided by the average value expressed as a percentage. The following acceptance criteria will be used to assess the RPD results:

Results > 10 times PQL = RPD value <= 50% are acceptable
Results between 5 & 10 times PQL = RPD value <= 75% are acceptable
Results < 5 times PQL = RPD value <= 100% are acceptable
If result is LPQL then 50% of the PQL is used for the calculation

RPD Results Above the Acceptance Criteria VALUE

Abbreviations:

PQL: Practical Quantitation Limit
LPQL: Less than PQL
NA: Not Analysed
NC: Not Calculated
OCP: Organochlorine Pesticides
OPP: Organophosphorus Pesticides
PCBs: Polychlorinated Biphenyls
TRH: Total Recoverable Hydrocarbons

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TABLE H
SUMMARY OF FIELD QA/QC RESULTS

ANALYSIS	Envirolab PQL		TB[S]	FR[S]	TS[S]
			11/04/2017	12/04/2017	10/04/2017
	mg/kg	µg/L	mg/kg	mg/kg	% Recovery
Benzene	1	1	LPQL	LPQL	106
Toluene	1	1	LPQL	LPQL	104
Ethylbenzene	1	1	LPQL	LPQL	101
m+p-xylene	2	2	LPQL	LPQL	101
o-xylene	1	1	LPQL	LPQL	99

Explanation:

[W] Sample type (water)

[S] Sample type (sand)

BTEX concentrations in trip spikes are presented as % recovery

Preliminary ESA

Values above PQLs/Acceptance criteria **VALUE**

Abbreviations:

PQL: Practical Quantitation Limit
LPQL: Less than PQL
NA: Not Analysed
NC: Not Calculated
TB: Trip Blank
TS: Trip Spike
RS: Rinsate Sample
TRH: Total Recoverable Hydrocarbons

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